LIVELIHOOD STRATEGIES OF FARM HOUSEHOLDS AND DISTRIBUTIONAL CONSEQUENCES

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ABSTRACT

Income diversification is common among Malaysian rural households. The diversification is undertaken as a means of managing risk or coping with any negative shocks to agricultural production. This study is aimed at identifying the livelihood strategies of rural households in the Northwest Selangor Integrated Agricultural Development Area and determining the effect of non-farm income sources on income inequality.

More than 71 percent of farm households are found to be involved in diversification with ex-ante risk management being the main motive for diversification. High and medium income households are more involved in high-return non-farm wage employment while low income households in low-return agricultural-wage employment.

Through the use of cluster analysis, four livelihood clusters were identified: highly specialized in farming, farming and agricultural-wage employment, specialization in non-farm employment, and finally, farming and non-farm employment. Households in livelihood clusters that combine farming and non-farm employment have significantly higher monthly percapita income.

The results from the multinomial logit regression of livelihood selection show that the size of cultivated land has a significant negative effect on the selection of a diversified livelihood strategy compared to farming dominated strategy. In selecting the most remunerative livelihood cluster, household size, the number of working members, and the average education of working members are significant determinants. This implies that higher education is a barrier to the selection of a livelihood cluster that specializes in non-farm employment. Other non-farm incomes and having borrowing

experience are significant to the selection of livelihood clusters that combine farming and agricultural-wage employment or non-farm employment.

The Gini coefficient for overall inequality is 0.400 but without non-farm income the Gini coefficient is lower with 0.382. This suggests that non-farm income is a source of increasing income inequality. Income is also more unequally distributed in livelihood clusters that combine farming with non-farm employment.

The decomposition of overall inequality reveals that the largest contributor to overall inequality is farm income (59 percent) while non-farm income contributes only 36 percent. In the decomposition of overall inequality by household assets using the regression-based approach, human capital was found to be the largest contributor to overall inequality through its effect on the inequality of non-farm wage and non-farm self-employment incomes. In terms of specific household assets, the important contributors to inequality are the number of working members, the average education of working members, the proportion of land owned, the size of cultivated land, credit access, the value of farm equipment owned, and household location.

The overall importance of non-farm activities suggests that the promotion of rural non-farm activities should be an important component of any rural development strategy in Malaysia. Nonetheless, policy makers must also consider the possibility for any intervention with the likelihood of creating barriers to entry that may limit the ability of low income households to take advantage of non-farm employment opportunities, especially the most remunerative and thus worsening inequality. The links between certain assets and activities imply that a particular policy is unlikely to fit different situations across households in different granary areas and that location specific policies are necessary.

ABSTRAK

Kepelbagaian pendapatan adalah satu kebiasaan dalam kalangan isi rumah luar bandar di Malaysia. Ini dilakukan sebagai satu cara untuk menguruskan risiko atau menghadapi sebarang pengurangan kepada pengeluaran pertanian. Kajian ini bertujuan untuk mengenal pasti strategi kehidupan isi rumah luar bandar di Kawasan Pembangunan Pertanian Bersepadu Barat Laut Selangor dan menentukan kesan sumber pendapatan bukan pertanian terhadap ketaksamaan pendapatan.

Lebih daripada 71 peratus isi rumah pertanian yang didapati terlibat dalam kepelbagaian pandapatan dengan pengurusan risiko *ex-ante* menjadi motif utama. Isi rumah berpendapatan tinggi dan sederhana lebih banyak terlibat dalam pekerjaan bukan pertanian yang memberikan pulangan yang tinggi manakala isi rumah berpendapatan rendah lebih cenderung kepada pekerjaan yang memberikan kadar pulangan yang rendah.

Melalui penggunaan analisis kelompok, empat kelompok kehidupan telah dikenal pasti: pengkhususan dalam pertanian, gabungan pertanian dan pekerjaan pertanian yang dibayar upah, pengkhususan dalam pekerjaan bukan pertanian, serta gabungan pertanian dan pekerjaan bukan pertanian. Isi rumah dalam kelompok kehidupan yang menggabungkan pertanian dan pekerjaan bukan pertanian mempunyai pendapatan bulanan perkapita yang lebih tinggi.

Berdasarkan analisis regresi *multinomial logit*, dapatan kajian menunjukkan bahawa keluasan bertanam mempunyai kesan negatif yang tinggi terhadap pemilihan kelompok kehidupan yang berdasarkan pelbagai aktiviti berbanding dengan kelompok yang mengkhusus kepada aktiviti pertanian. Dalam memilih kelompok kehidupan yang memberikan pendapatan yang tertinggi, saiz isi rumah, bilangan pekerja dan tahap pendidikan pekerja adalah faktor-faktor yang siginifikan. Ini menunjukkan bahawa

tahap pendidikan yang tinggi adalah satu halangan kepada pemilihan kelompok kehidupan yang berdasarkan pengkhususan dalam pekerjaan bukan pertanian. Pendapatan bukan pertanian yang lain dan mempunyai pengalaman meminjam adalah signifikan kepada pemilihan kelompok kehidupan yang menggabungkan aktiviti pertanian dan pekerjaan pertanian yang dibayar upah atau pekerjaan bukan pertanian.

Pekali Gini untuk ketaksamaan keseluruhan adalah 0.400 tetapi tanpa pendapatan bukan pertanian pekali Gini adalah lebih rendah, iaitu 0.382. Ini menunjukkan bahawa pendapatan bukan pertanian adalah sumber yang meningkatkan ketaksamaan dalam agihan pendapatan. Kelompok kehidupan yang menggabungkan pertanian dan pekerjaan bukan pertanian didapati mempunyai ketaksamaan agihan pendapatan yang lebih tinggi.

Penghuraian ketaksamaan agihan pendapatan mendapati bahawa penyumbang terbesar kepada ketaksamaan adalah pendapatan pertanian (59 peratus) manakala pendapatan bukan pertanian menyumbang hanya 36 peratus. Dalam penghuraian ketaksamaan menggunakan aset isi rumah berdasarkan pendekatan kaedah berasaskan regresi, modal insan didapati menjadi penyumbang terbesar kepada ketaksamaan keseluruhan melalui kesannya terhadap ketaksamaan pendapatan bergaji dalam pekerjaan bukan pertanian dan pendapatan dari bekerja sendiri dalam aktiviti bukan pertanian. Secara lebih terperinci, aset isi rumah yang menjadi penyumbang penting kepada ketaksamaan adalah bilangan pekerja, tahap pendidikan pekerja, peratusan tanah yang dimiliki, saiz kawasan bertanam, pengalaman meminjam, nilai peralatan pertanian yang dimiliki, dan lokasi isi rumah.

Kepentingan aktiviti bukan pertanian menunjukkan bahawa usaha-usaha untuk mempromosikan aktiviti bukan pertanian di kawasan luar bandar perlu menjadi komponen utama kepada strategi pembangunan luar bandar di Malaysia. Walau

bagaimanapun, penggubal dasar perlu mempertimbangkan kemungkinan wujudnya halangan kepada penyertaan hasil daripada sebarang strategi. Ini boleh mengehadkan keupayaan isi rumah berpendapatan rendah untuk melibatkan diri dalam peluang pekerjaan bukan pertanian, terutamanya yang boleh memberikan pulangan yang tinggi dan menyebabkan ketaksamaan pendapatan yang lebih tinggi. Hubungan antara aset dan aktiviti tertentu menunjukkan bahawa sesuatu dasar adalah tidak sesuai untuk semua situasi isi rumah di kawasan jelapang padi yang berlainan. Oleh itu, dasar pembangunan juga perlu mengambil kira perbezaan lokasi isi rumah.

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TABLE OF CONTENTS

LIST OF FIGURES

PAGE

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Motivation of Study

Rural development strategies and policies have previously been implemented with an emphasis on enhancing the productivity in farming by using modern technologies in order to reduce poverty. This is because a majority of the population in developing countries resides in rural areas and is mostly involved in farming as their main source of income. Nevertheless, the effectiveness of this approach has been questioned because poverty rates have been persistently high among rural households and agricultural productivity has stagnated over time. Poverty rates have also been found to be high in areas with low agricultural potential which are difficult to reach directly with interventions that are targeted for the agricultural sector. Therefore, the non-farm sector could be a potential entry point for policy interventions in such areas. Furthermore, rural households are already diversifying their income through greater participation in non-farm employment rather than being dependent on only one income source such as agricultural income. Throughout this study income diversification refers to diversification out of agriculture where households participate in multiple income generating activities which include agricultural-wage and non-farm employments.

The rural non-farm economy has long been neglected by policy makers; however, in recent years considerable attention has been given to the importance of non-farm income in rural household income (Haggblade, Hazell, & Reardon, 2010). Barrett et al. (2001) in differentiating between farm and non-farm income, refer to farm income as income that is obtained from the production or gathering of unprocessed crops, livestock, forest, or fish products from natural resources. Non-farm income, on the other hand, refers to all other sources of income, which includes incomes from processing,

transport, or trading of unprocessed agricultural, forest and fish products. From this perspective, the assignment of farm or non-farm is more concerned with the nature of the product and the types of factors that are used in the production process. Conversely, the difference between farm income and off-farm income is based on the location where the activity takes place (in the home, on the farm, in town or abroad). Activities concerning formal employment such as teaching, businesses and migrant labor are considered as non-farm as well as off-farm activities. According to the above definition, agro-processing or food processing, for example, is a non-farm activity because it involves processing of agricultural products, while temporary agricultural-wage employment is categorized as a farm activity but it is 'off' one's own farm.

Following Reardon et al. (2001), this study defines non-farm activities as any activities outside of agriculture. This means non-farm activities include activities in industries (e.g. mining, wood products, energy, food and beverages, textiles and leather as well as construction materials) and services such as commerce, hotels and restaurants, transport, public works and private health (Stifel, 2010). Another related term is non-farm employment. There are two major components of non-farm employment which are wage employment and self-employment. Wage employment allows the poor to participate because it does not require any complementary physical capital. In this study the definition of household income follows the definition by Barrett et al. (2001) where household income refers to the income earned by rural households regardless of where the income is earned, whether in rural or urban areas. Income sources are divided into five categories (i) farm income; (ii) agricultural-wage income; (iii) non-farm wage income; (iv) non-farm self-employment income; (v) other income comprising of remittances, pensions, zakat and rental income. The relationship among these income categories is illustrated in Figure 1.1.

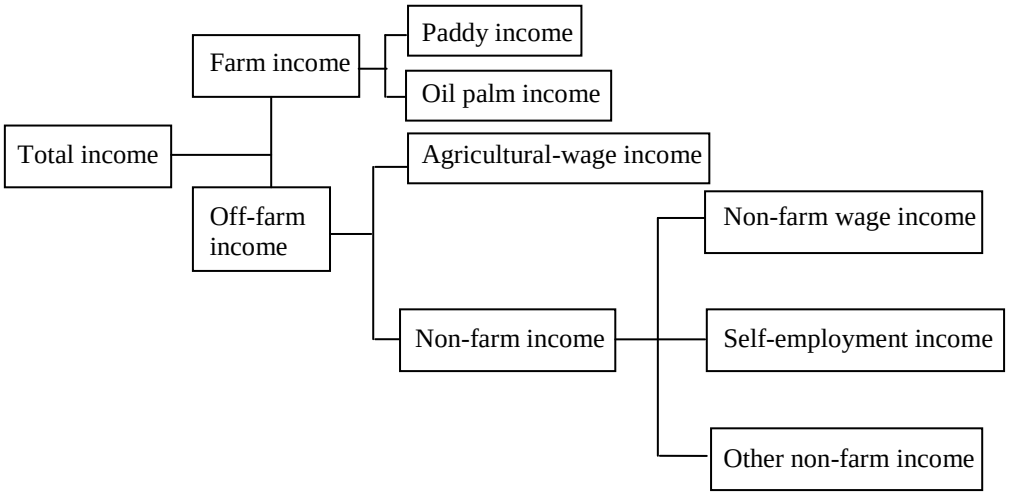


Figure 1.1: Relationship among income sources

Ranjan (2006) in discussing occupational diversification and access to rural employment highlighted several roles of the non-farm sector with respect to poverty and income distribution. The non-farm sector can be developed as a means of reducing rural poverty because the agricultural sector alone is incapable of sustaining the growing rural communities. Furthermore, most rural communities obtain income from various sources rather than from agriculture only. The development of the non-farm sector can also reduce rural-urban migration; reduce economic disparities between rural and urban areas; reduce unemployment in rural areas, in particular through the establishment of labor-intensive rural industries using local resources which will absorb excess labor in rural areas (Anderson, 1982; Mukhopadhyay & Chee, 1985; Harriss, 1987; Lanjouw & Lanjouw, 2001). The non-farm sector can support the growth of the agricultural sector through the intensification of linkages between the industrial and agricultural sectors. The non-farm sector can also help improve the level of income inequality in rural areas, with greater participation of poor households in non-farm activities. Finally, the development of the non-farm sector encourages greater participation of women in non-farm activities hence providing them with greater empowerment.

The diversity of rural livelihoods has been widely acknowledged by scholars of rural studies, signifying that specialization is no longer the norm among rural households. Furthermore, rural households have different levels of commitments to agriculture (Omilola, 2009). Ellis (1998) refers to livelihood diversification as a process whereby rural households develop a diverse portfolio of activities and social support capabilities to ensure their survival and to improve their standards of living. Household diversification can either be in the form of greater multiplicity of activities in various sectors or it can refer to a shift away from traditional rural sectors such as agriculture to non-traditional activities (Start & Johnson, 2004). Diversification out of agriculture is a common finding among livelihood diversification studies as it is one of the strategies that have been employed by rural households as a way to minimize income variability and to ensure a minimum level of income (Alderman & Paxson, 1992). In addition, diversification has also been regarded as a rational response to the lack of opportunities to specialize (Iiyama, Kariuki, Kristjanson, Kaitibie, & Maitima, 2008).

Non-farm employment has an increasing importance to rural households in developing countries (Barrett, Bezuneh, Clay, & Reardon, 2005; Barrett, Reardon, & Webb, 2001; De Janvry & Sadoulet, 2001; Lanjouw & Lanjouw, 2001; Reardon, 1997). There is growing evidence that rural households in developing countries are earning an increasing share of their income from non-farm sources. A review of income sources by Reardon et al. (1998) revealed the remarkable importance of non-agricultural sources of employment and income. Income from rural non-farm activities accounted for 42 percent of the income of rural households in Africa, 40 percent in Latin America, 32 percent in Asia, and 39 percent in South Asia, with the data indicating increasing trend overtime. In a more recent study, these activities have been found to contribute between 30 percent and 45 percent to rural household incomes in developing countries (Haggblade, et al., 2010).

In view of the growing importance of non-farm income sources to rural households, non-farm activities have been regarded as an engine of growth for rural areas. Consequently, the focus of rural development is now on the creation of greater non-farm income-earning opportunities and the enhancement of access for the rural poor to these sources of income (Berdegué, Ramírez, Reardon, & Escobar, 2001). This also indicates that household diversification into non-farm activities has implications for rural poverty reduction policies. In addition, diversification out of agriculture also implies that conventional approaches to increasing employment, income and productivity in single occupations, such as farming, have been missing their targets (Ellis, 2000).

The greater importance of non-farm income to rural households suggests that non-farm activities can no longer be considered as "marginal". In general, non-farm activities play an important role in breaking the vicious cycle of poverty because non-farm income can significantly increase the total income of rural households, smooth out income fluctuations, and improve food security through savings, as it allows rural households to cope with sudden shocks (De Janvry, Sadoulet, & Zhu, 2005; Ellis, 1998). However, the effect of non-farm employment on poverty is ambiguous. Richer households tend to participate more in non-farm employment compared to poor households (Abdulai & CroleRees, 2001). This indicates that poorer households are less diversified than wealthier households and may result in the worsening of poverty or leave the poverty level unaffected. Conversely, poor households may participate substantially in the non-farm sector. This could lead to a reduction in poverty especially in poorer areas, among poorer households and the landless. It has been suggested that the poverty rate could be higher if it were not for non-farm incomes (Arif, Nazli, & Haq, 2000; Berdegué, et al., 2001; Foster & Rosenzweig, 2004; Lanjouw & Murgai, 2008; Reardon, Stamoulis, Balisacan, Berdegué, & Banks, 1998).

As in other rural economies in developing countries, most rural households in Malaysia have combined farming with off-farm work for their livelihoods as shown in Table 1.1. It can be observed that farm income is still the main source of income for rural households. The nature of rural off-farm work varies from high salaried wage labor and profitable business enterprises to low wage labor and marginal businesses.

Table 1.1: Source of rural income

			Share of income source (%)	
Researcher (s)	**Survey year**	**Area**	**Farm**	**Off-farm**
Fredericks & Wells (1978)	1975/76	Tanjung Karang	66.8	33.2
Haughton (1983)	1962	Penang	82	18
	1966	Penang	77	23
	1972/73	MUDA, Kedah	97	3
	1978/79	MUDA, Kedah	77	23
	1982	Tanjung Karang	73	27
Shand (1987)	1980	Kemubu, Kelantan	58	42
	1981	Kemubu, Kelantan	38	62
Ishida & Azizan (1998)	1990	Tanjung Karang	67.5	32.5
Siti Hadijah et al. (2012)	2008	Kedah	62.2	37.8

The individual studies, especially those in the 70's and 80's were impact studies which were carried out at a time when the full benefits of the new paddy irrigation schemes were being experienced by farmers in the respective rice growing areas. Despite the increasing involvement of rural households in off-farm employment, there still remain households that do not participate in any off-farm activities. The differences in the type and level of household participation in off-farm employment are unequally distributed across households. This indicates the importance of understanding the main determinants of participation in different off-farm activities. More specifically, it is important to understand the reasons for household selection of livelihood strategies which include diversification into off-farm work. This understanding would enable the development of poverty reduction strategies through expansion of off-farm opportunities to the poor and vulnerable farm households. Throughout this current

study, a livelihood strategy refers to how households access and use their assets, within various social, economic, political, and environmental contexts, in order for them to earn a living. There is an enormous range and diversity of livelihood strategies. An individual may participate in several activities to meet his/her needs. Within households, individuals often take on different responsibilities in order to ensure sufficient income and growth of the family.

The reduction of rural poverty has been a long standing concern of governments all over the world, including Malaysia. Economic growth has often been regarded as the mechanism for poverty alleviation. However, the importance of economic growth to poverty reduction can be undermined if the benefits of growth are not equitably distributed among the population, especially among the poorest and most vulnerable groups in a society (Bourguignon, 2003).

Malaysia's effort in poverty eradication is commendable. This is proven by the successful reduction of poverty incidence from 49.3 percent in 1970 to 3.8 percent in 2009 and is expected to decrease further to only 2.0 percent by 2015 (Malaysia, 2010a). As in the 10th Malaysia Plan (2010-2015), it has been targeted that the mean income of households in the bottom 40 percent group is to be increased from RM1,440 in 2009 to RM2,300 by 2015. Malaysia's achievement of the first millennium goal (MDG 1), which is halving the level of poverty by 2015, has also been commendable as the target has already been achieved in 1999 when the level of poverty decreased to 7.5 percent. The reduction of poverty is also experienced in the rural and urban areas, although the level of rural poverty has been consistently higher compared to urban poverty. Due to the higher incidence of poverty in rural areas, poverty has become primarily a rural phenomenon (Fatimah & Mad Nasir, 1997; Ragayah, 1999).

While Malaysia has made great strides in poverty reduction over the last four decades, there are still significant challenges as poverty incidence is still high, especially among agricultural households. Smallholders in the production of crops such as rubber, oil palm, coconut, and paddy, as well as fishermen and estate workers are among the target groups of the government's poverty reduction strategies since the country's independence in 1957. In general, the poverty rate among paddy farmers has shown a decreasing trend. As shown by Table 1.2, the incidence of poverty among paddy farmers, for the country as a whole, has decreased from 29.4 percent in 1999 to 19.1 percent in 2009.

Table 1.2: Incidence of poverty in the Malaysian agriculture sector (%)

Sub-sector	1999	2004	2009
Rubber smallholders	29.8	18.8	15.0
Oil palm smallholders	15.4	13.3	4.5
Coconut smallholders	41.8	30.9	34.0
Paddy farmers	29.4	25.7	19.1
Other agriculture*	24.9	13.8	10.9
Fishermen	34.9	31.8	23.8
Estate workers	24.0	20.2	16.0
Agriculture	25.1	18.1	12.2
National	8.5	5.7	3.8

Source: Household Income Surveys, Economic Planning Unit

Note: * Include tobacco growers, miscellaneous agriculture, vegetable and fruit growers, pepper smallholders, pineapple smallholders and livestock and poultry farmers

The paddy sector has the third highest level of poverty incidence after coconut smallholders and fishermen. This reduction was partly achieved as a result of the implementation of various strategies with the objective of increasing the productivity, output and income of paddy farmers through the provision of irrigation facilities and improvement of production technologies (Malaysia, 1999). These famers are producing in designated granary areas that have been conserved as prime agricultural areas under the National Physical Plan (Malaysia, 2005). This is in view of the critical role of these areas in meeting Malaysia's self-sufficiency target in rice production. This also implies

that farmers in these areas will continue to earn income from paddy production in addition to other incomes that they may earn from other non-farm activities. The contribution of farm income in their total household income may continue to be more substantial compared to non-farm income (Table 1.1).

In spite of the decreasing poverty trend in almost all of the agriculture sector's target groups, the poverty incidence has been persistent. Paddy farmers, for instance, continue to be one of the target groups for the government's poverty eradication strategy, despite various government assistances. Small landholdings and limited capital resources of small farmers have often been suggested as the main reasons for their inability to benefit from the technological advancement and the efficient use of such technologies (Abdul Aziz, 1990; Chamhuri, 1988). Paddy farmers, like any other farmers around the world, are vulnerable to factors affecting their agricultural production such as climatic changes and global trade arrangements, as these changes will have significant consequences on their income from paddy cultivation. This would also indicate a continued vulnerability to poverty. The persistence of poverty in the paddy sector is also a reflection of the ineffectiveness of the government's poverty eradication strategy (Chamhuri, 1988). The effects of government interventions have not been significant among the poorest households. Therefore, in an effort to further reduce rural poverty the focus is both on small-scale agricultural production and the promotion of rural non-farm employment and incomes as suggested in the Rural Development Master Plan (Malaysia, 2010b).

Today, it is common to find Malaysian paddy farmers participating in non-farm activities as a means of obtaining higher and more stable income for the family (Ishida & Azizan, 1998; Norsida & Sadiya, 2009; Terano & Fujimoto, 2009). The changing nature of paddy cultivation has lead to a reduction in the number of full-time farmers. This was observed by Terano and Fujimoto (2009) in the Seberang Prai granary area in

Penang. According to the researchers, full-time farmers in the study village have decreased from 83 percent in 1978 to 67 percent in 1987, and drastically to 31 percent in 2006. On the other hand, the part-time farmers have gradually increased from 12 percent in 1978 to 55 percent in 2006. This would suggest that paddy farmers in granary areas are mainly part time farmers and may have non-farm income as their main source of income. In studying the factors affecting farmer participation in off-farm employment in the granary area of Kemasin Semerak, Norsida (2009) found that 54 percent of the 250 paddy farmers are involved in off-farm employment. In another study by Siti Hadijah, Ahmad Zafarullah and Mukaramah (2012) of rural households in Kedah observed that only 32 percent of the 381 households have some form of non-farm income.

As rational economic agents, farm households' decision to increase their labor supply to non-farm activities may be a form of ex-post response to a shock (Kochar, 1999) or ex-ante decision which is based on the need for alternative income sources in a risky environment (Barrett & Reardon, 2000; Rose, 2001). In a study by Bailey (1982) of paddy farmers in Besut, Terengganu, it was observed that farm households consciously seek to diversify both their sources of risk and income rather than invest heavily in time, energy, land, and working capital to maximize income from any single activity. Rice farmers are involved in a wide range of economic activities, some of which may conflict with the demand of paddy cultivation, hence making them part-time farmers. Shand (1987) found an increase in the proportion of farmers' involvement in non-farm employment in the Kemubu granary area from 60 percent in 1980 to 66 percent in 1981. This change in involvement is also reflected in the share of non-farm income in total household income, which increased from 42 percent (1980) to 62 percent (1981). The increase has been due to poor harvest which indicates that the increase in household participation in non-farm activities is an ex-post response to risk.

This emphasizes the importance of non-farm income in smoothing total income in the event of a shock.

Non-farm income can be a complement or a substitute to farm income. For a household in a designated granary area non-farm income is a complement rather than a substitute to farm income. This is because non-farm income may be used to purchase farm inputs and investment. On the contrary, non-farm income can also be a substitute to farm income if farm households are forced to participate in non-farm activities as a consequence of low agricultural productivity (De Janvry & Sadoulet, 2001). Regardless of the responsibility of fulfilling the rice self-sufficiency requirement, household dependence on a single crop is not an effective way to eradicate poverty as the income from paddy and rice subsidies may not be sufficient to increase the farmers' income above the poverty line income (Sukor, 1983). In coping with poverty and income variability, paddy farmers in granary areas have therefore, diversified their sources of income as shown in Table 1.3.

Table 1.3: Average income of paddy farmers

	Annual income of paddy farmers			
Granary area	**Main occupation (%)**	**Secondary occupation (%)**	**Other occupation (%)**	**Total income (RM)**
KADA, Kelantan	70.7	27.4	1.95	11,999
MADA, Kedah	90.1	8.9	1.0	17,230
IADA Kerian Sg. Manik	74.8	22.7	2.6	7,893
IADA Barat Laut Selangor	75.4	23.9	0.7	12,685
IADA Pulau Pinang	73.3	19.0	7.7	14,420
KETARA, Terengganu	74.1	25.6	0.3	9,724
IADA Kemasin Semerak	54.9	37.3	7.8	12,146
IADA Seberang Perak	78.5	17.4	4.2	12,500

Source: MOA (2005)

On average, farmers in the eight granary areas earn an annual income of more than RM10,000 per year except for Kerian Sungai Manik (RM7,893) and KETARA (RM9,724). More than 70 percent of the farmers' income is from the farmers' main economic activity, which is from paddy cultivation. The contribution of income from

secondary employment to the farmers' income is between 20 percent and 30 percent in all of the granary areas except for MADA (8.9 percent). Other sources of income such as pensions do not have a significant contribution to income as a majority of the farmers is not wage or salary earners.

Roslan and Siti Hadijah (2011), in their study of rural households in Kedah have also highlighted the fact that farmers who participate in non-farm activities have a shorter duration of exiting poverty. It was estimated that with an income growth of 5 percent, on average, the poor will take about 10 years to exit poverty. Consequently, the study suggested that one of the ways to achieve the poverty reduction target of 2.0 percent, as targeted in the 10^{th} Malaysia Plan, is by inducing farmers to participate in non-farm activities.

The decreasing trend in poverty incidence has also manifested itself in the reduction of the government's budget allocation for agriculture and rural development. About RM1,920 million (26.5 percent) was allocated for agriculture and rural development for the period 1971-1975 and this allocation has been reduced to RM1,880 million (3.8 percent) for the year 2012. The reduction in this budget item may be due to the government's confidence in the favorable achievement in poverty reduction strategies. Indirectly, the reduction of allocation for agriculture and rural development also implies a greater and an increasing allocation of development budget to other sectors, in particular the non-agricultural sector. A much higher allocation of budget to these sectors may be partly responsible for the greater opportunity for rural households to increase their income by diversifying into non-agricultural activities. This type of income diversification would enable rural households, especially the poor and vulnerable, to lift themselves out of poverty or to even escape the poverty trap.

A household's decision to participate in non-farm employment, however, tends to differ between different types of non-farm activities which in turn, are very much dependent on a household's asset endowments. As an example, human capital in the form of education, as well as individual and household characteristics are important factors determining a household's ability to overcome the barriers into high-return activities, thus reducing the likelihood of being poor (Reardon, Berdegué, & Escobar, 2001; Siti Hadijah & Roslan, 2011). Social capital, on the other hand, is important in migration studies as it will affect the migration decision of new migrants (Xia & Simmons, 2004; Zhao, 2002, 2003). The availability of credit together with the use of advanced production technology has enabled farm households to earn higher farm income, reallocate more household labor to non-farm activities or be involved in self-employment (Devendra & Abdul Aziz, 1994; Norsida & Sadiya, 2009), resulting in higher total household income. There have also been studies that have indicated that poor households have been found to sell off their assets, as a result of diversification. As a consequence, these households will have lesser productive assets thereby increasing inequality and possibly trapping them in poverty (Reardon & Taylor, 1996).

Since the late 1990s, there has been a renewal of interest on income distribution (Atkinson, 1997). This is because income inequality is not only an outcome of growth but it is also a determinant of growth. This has been emphasized by Bourguignon (2003) in his seminal work on the relationship between poverty, growth, and inequality. Higher income inequality may not necessarily lead to higher poverty levels. If the population at the bottom of the income distribution receives a smaller share of income, it will result in higher poverty (McKay, 2002). On the contrary, if growth results in higher income for the poor then inequality will increase but it may not affect the level of poverty. Inequality can also have an indirect impact in increasing poverty by reducing the amount of economic growth itself (Bourguignon, 2003).

The issue of unequal distribution of income in Malaysia has continuously been given considerable emphasis since independence as it is one of the main thrusts of each of the five-year Malaysia plans. The overall Gini coefficient for Malaysia has shown a reduction from 0.513 (1970) to 0.441 (2009). Despite the reductions in the 1970s and 1980s, inequality has leveled out at relatively high levels. During the early stages of its development, the Malaysian economic growth was accompanied by a continuous decrease in inequality. This is shown by the reduction in the Gini coefficient from 0.513 in 1970 to 0.443 in 1999. This is also observed for both the rural and urban Gini coefficient as shown by Figure 1.2.

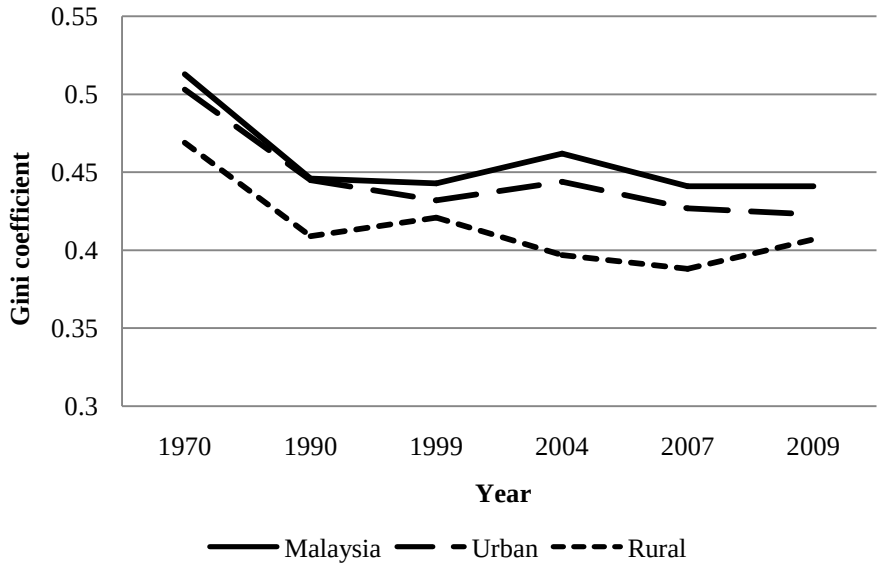


Figure 1.2: Urban and rural Gini coefficient, Malaysia (1970 – 2009)

The income inequality in rural areas has been persistently lower compared to the inequality in urban areas. What are the factors that have caused such a trend in rural areas? This can be partly due to the rural and regional development policies which were implemented under the New Economic Policy (NEP), the development and advancement in education and training programs, and the rapid expansion of labor-intensive manufacturing and service sectors (Ragayah, 2008b). This has resulted in greater involvement of rural households into non-farm employment especially among

farm households. Furthermore, they are among the groups that require additional income to enable them to sustain their livelihoods. If this is the case then household participation in non-farm activities may be able to explain the declining trend in rural income inequality. Despite the importance of the issue of income inequality, there have been few studies that link income inequality to non-farm activities, in particular non-farm labor incomes.

After 1999, the overall Gini coefficient has started to increase from 0.443 in 1999 to 0.462 in 2004, while it decreases to 0.441 in 2009. Despite the reduction in overall inequality, the concern is on the inequality between urban and rural households and between the Bumiputera and non-Bumiputera ethnic groups. In 2004 the rural inequality, as shown by the rural Gini coefficient is 0.397 while it was 0.444 for urban inequality. This reduction is also observed in 2007 where the rural Gini coefficient was 0.388 and for urban inequality it was 0.427. The urban inequality has continued to decrease to 0.423 in 2009; however, the rural inequality has increased to 0.407. This has resulted in an overall inequality level of 0.441 for 2009, which is the same level as that for 2007. These inequality trends are troubling as they can present significant challenges to the sustainability of development.

The urban-rural income disparity ratio has also narrowed from 2.14 in 1970 to 1.85 in 2009. The decomposition of household income shows that within group inequality is a greater contributor to total inequality compared to between group inequalities. As an example, 94.6 percent of total inequality for 2007 is accounted for by the within group differences while only 5.4 percent is explained by the between group differences. The between group inequality component has been declining since 1995 from 10.1 percent to 5.4 percent in 2007. This implies that the policies implemented to narrow inter-ethnic differences have been effective, but may have caused the income inequalities within ethnic groups to widen (Ragayah, 2008b).

The greater role of the within-group inequality in determining the level of overall inequality contradicts the widely accepted view that urban-rural income disparity is the main cause for the existing inequality. This is implied by the strategy of decreasing urban-rural inequality as a way to decrease Malaysia's overall inequality during the 9th Malaysia plan period (Ragayah, 2008a). The within-group inequality is shown by Figure 1.2. It can be seen that although the inequality has been decreasing within each ethnic group but the inequality within the Bumiputera group has remained the highest compared to the other two main ethnic groups. The mean income for the Bumiputera is also the lowest among the three ethnic groups (Table 1.4).

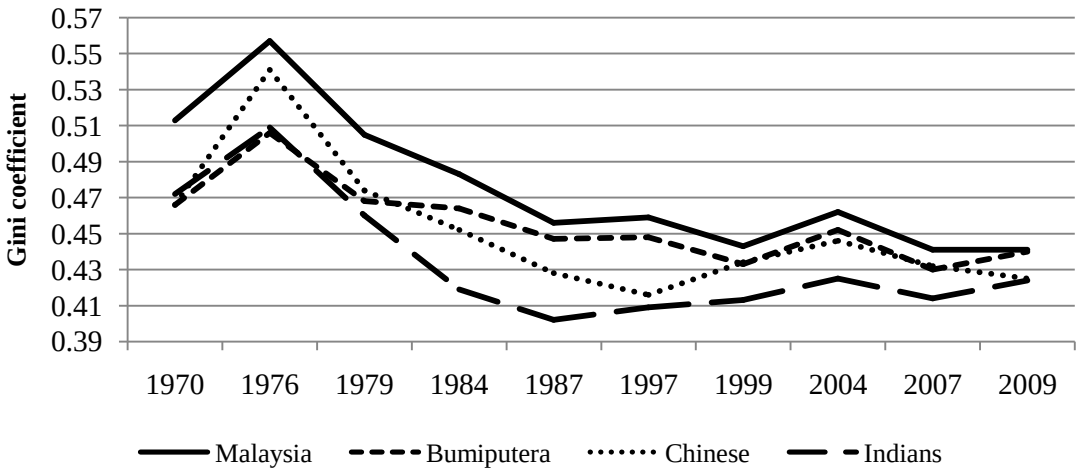


Figure 1.3: Ethnic Income Distribution, Malaysia (1970 – 2009)

Table 1.4 shows the mean income and the income distribution from 1970 to 2009. It shows that while the mean monthly household income increased from RM264 in 1970 to RM4,025 in 2009, income inequality had also improved as indicated by the decrease in overall Gini coefficient from 0.513 to 0.441. The rich (top 20 percent) have benefited the most from the rapid economic growth at the expense of the middle and low income groups. However, the share of the national income captured by the high income group has been decreasing from 55.7 percent (1970) to 49.6 percent (2009). In contrast, the share of national income as captured by the middle and low income groups

have increased from 32.8 percent to 36.1 percent and 11.5 percent to 14.3 percent, respectively, for the same period.

Table 1.4: Distribution of household income by ethnic group (1970 – 2009)

	1970[a]	1979	1989[b]	1999	2009
Malaysia					
Mean income (RM/month)	264	678	1,169	2,472	4,025
Gini coefficient	0.513	0.505	0.442	0.443	0.441
Income share of:					
Top 20%	55.7	55.7	50.5	50.5	49.6
Middle 40%	32.8	32.7	35.5	35.5	36.1
Bottom 40%	11.5	11.9	14.5	14.0	14.3
Bumiputera					
Mean income (RM/month)	172	492	940	1,984	3,624
Gini coefficient	0.466	0.468	0.429	0.433	0.440
Income share of:					
Top 20%	51.6	51.8	49.0	48.7	49.5
Middle 40%	35.2	34.9	35.9	36.4	36.1
Bottom 40%	13.2	13.3	15.1	14.9	14.4
Chinese					
Mean income (RM/month)	394	1,002	1,631	3,456	5,011
Gini coefficient	0.466	0.474	0.419	0.434	0.425
Income share of:					
Top 20%	52.6	52.5	48.1	48.8	48.4
Middle 40%	34.1	34.3	36.3	36.5	36.4
Bottom 40%	13.3	13.2	15.6	14.7	15.2
Indians					
Mean income (RM/month)	304	756	1,209	2,702	3,999
Gini coefficient	0.472	0.460	0.390	0.413	0.424
Income share of:					
Top 20%	54.0	52.0	46.3	47.6	48.8
Middle 40%	31.2	33.6	36.2	36.3	35.7
Bottom 40%	14.8	14.4	17.5	16.1	15.5

Source: Economic Planning Unit, 2010.

Note: [a] Refers to Peninsular Malaysia only.
[b] Starting 1989, data is based on Malaysian citizens.

There has been a continued debate to the issue of equity implications of income growth in the non-farm rural sector of developing countries. It has been strongly argued that the income benefits from the modernization of agriculture as a result of the Green Revolution have been very unequally distributed, favoring large over small farmers and in areas with irrigation facilities and those without such facilities (Blyn, 1983; Cleaver,

1972; Falcon, 1970). Others have argued that the technology is scale neutral and that the effects on distributional equity are dependent on the access of farmers to the necessary inputs (Hayami, 2000). In view of the possible effects of inequality on the level of poverty it is therefore, crucial to examine the determinants of rural income inequality. In addition, the growing importance of non-farm income in total household income has also made it imperative to analyze the factors that have lead to the ambiguous effect of non-farm income on the distribution of household income.

The prevalence of labor-intensive, low-return rural non-farm activities may indicate distress diversification and the absence of more productive opportunities, especially among households with low capital or productive assets. This will translate into low-productivity and low returns to labor. This segmentation may contribute to a rather ambiguous effect of non-farm earnings on rural income distribution (Adams & He, 1995; Adams, 2002; Lanjouw & Lanjouw, 2001; Lanjouw & Shariff, 2004; Reardon, Taylor, Stamoulis, Lanjouw, & Balisacan, 2000). Non-farm income may improve or exacerbate inequality. The distribution of income will improve if the non-farm activities are accessible to poor households. Non-farm income may also result in a worsening of income distribution due to entry barriers for the poor (Woldenhanna, 2002). In some conditions, a U-shaped relationship may occur between household welfare and non-farm income shares where the poor and the rich receive proportionately more of their total income from non-farm sources. In addition there may not even be any consistent pattern between non-farm income and inequality (Haggblade, et al., 2010).

Within the Malaysian context, income diversification studies by Fredericks and Wells (1978), as well as by Ishida, and Azizan (1998) of rice farmers in Tanjung Karang, Selangor, have found that off-farm or non-farm income has an inequality decreasing effect. However, a comparative study by Shand (1987) of rice farmers within

and outside the Kemubu granary area and in a more recent study by Siti Hadijah et al. (2011) of rural households in Kedah have found an inequality increasing effect of non-farm income. These studies have mainly identified the size of landholdings as the main source of inequality among rural households. The larger the landholdings the larger will be the provision of subsidies as the amount of subsidies received is highly dependent on the volume of production and the size of cultivated land. Larger farms have obviously gained more from the subsidy hence worsening the income disparity among paddy farmers (Chamhuri, 1988; Tengku Mohd Ariff & Ariffin, 1998). Although the size of landholdings has been identified as the main source of inequality the justification has been made based on a descriptive analysis of the distribution of landholdings among farm households.

Another possible source of income inequality among rural households comes from their participation in non-farm activities. Since household involvement in non-farm activities is now a common means of supplementing their uncertain agricultural income, it is not sufficient to only determine the level of income inequality in the granary area. What is more important is to examine the factors that determine the level of income inequality. In addition to landholdings, there is also a possibility of other household assets that may be responsible for the inequality among rural households. Households' asset endowments will determine their participation in non-farm activities and together with the heterogeneity of rural non-farm activities this will result in productivity and profitability differences. The diversification strategies of the rich, for example, are different from the diversification strategies of the poor where the later tend to dominate low-return activities and in wage labor. On the contrary, the non-poor households are able to find employment in more lucrative jobs. This will result in the differences in the level of earnings from non-farm activities by the poor and non-poor households. This was observed by Reardon (1997) where the non-farm income shares of

the rich is much larger compared to the poor rural households in Africa. Similar findings were also observed for Argentina and Mexico.

The distributional effects of non-farm activities also depend on the livelihood strategies chosen by rural households, which are very much influenced by their asset endowments (Lay, Mahmoud, & M'Mukaria, 2008). Although studies have revealed the ambiguous distributional effects of household participation in non-farm activities (Ferreira & Lanjouw, 2001; Haggblade, Hazell, & Reardon, 2005), only few have explicitly analyzed the effects of a chosen livelihood strategy and household assets on income inequality (Arayama, Kim, & Kimhi, 2006).

Farm households are operating in environments that are biophysically and socio-economically different. As a consequence, these households have developed different livelihood strategies which are basically driven by opportunities and constraints that they encounter in these environments. Households within the same localities and villages differ in resource endowment, production orientation and objectives, education, past experience and management skills (Crowley & Carter, 2000) and in their risk preferences, all of which shapes the diverse nature of rural livelihood strategies. This implies that a common policy is not able to provide adequate solutions to the problem of poverty. Recognizing the differences within and among farms as well as across localities is the first step in designing policies to help poor farmers (Ruben & Pender, 2004). This recognition is also important to the successful adoption and performance of new technologies in improving agricultural production. Improving the understanding of the determinants of diversity among households, and having the ability to categorize livelihood strategies as well as farming objectives would assist in a more efficient targeting of agricultural innovation (Tittonell, et al., 2010).

1.2 Research Problem

Previous poverty eradication strategies in Malaysia have been mainly centered on the development of the agricultural sector. This is because most of the poor in Malaysia as in other developing countries still reside in rural areas and are mostly involved in agricultural activities. As a consequence, the rural development strategy has been mainly focused on increasing farm productivity through the use of modern technologies as a way out of poverty. This strategy has a remarkable effect in reducing rural poverty, hence overall poverty in the Malaysian economy. However, rural poverty has been persistently higher compared to urban poverty, despite the decreasing poverty trend. Another trend among rural households is their greater tendency to diversify out of agriculture by participating in non-farm activities as this type of diversification would reduce the risk associated with crop production. Income from these activities are able to provide households with greater income and hence consumption stability.

Given the growing importance of non-farm earnings among rural households, knowledge of the distributional consequences of non-farm employment is also imperative. Do non-farm earnings result in a decrease or increase in rural income inequality? Another related aspect of distributional consequences is the determination of conditions or factors that may have contributed to the resulting inequality level. The concentration of high return activities among non-poor rural households could result in the worsening of income inequality. However, poor households may have access to most non-farm activities thereby lowering inequality. These possible outcomes will have important policy implications especially within the context of policy interventions which are intended for increasing income diversification opportunities. This increasing diversification trend may have serious consequences on rural inequality and the inequality within the Bumiputera ethnic group, which has the most unequally

distributed income compared to the other two main ethnic groups – the Chinese and Indians.

Households in more developed agricultural areas are already combining farming with off-farm income earning activities as part of their livelihoods. Although a majority of households in these areas may not be poor, but they are vulnerable to poverty. In other words, the poor are usually among the most vulnerable, but not all vulnerable households are poor. This distinction facilitates the differentiation among lower-income populations (Moser, 1998). The poor are usually associated with low income but those who earn low income may not necessarily be poor (Ma'arof, 2004). They are faced with the risk of falling into poverty in the future as the income of farm households are often severely affected by shocks such as droughts or reduction in farm prices despite the irrigation facilities and subsidies. Vulnerability is a key dimension of well-being since it affects individuals' behavior in terms of investment, production patterns, and coping strategies, and in terms of the perceptions of their own situations.

The nature of rural non-farm work varies from high return activities and profitable business enterprises to low return activities in the form of wage labor and marginal businesses. Although most rural households are involved in some form of diversification, there are rural households that still remained dependent on a single income source, in particular from crop cultivation. The heterogeneity of non-farm activities and the differences in the level of household involvement in non-farm work imply the importance of understanding the determinants of participation decisions into different non-farm activities. In addition, the understanding is also of utmost importance if poverty reduction is to be sustained through strategies that are based on the expansion of non-farm opportunities to the low income households.

Although the government has provided various incentives to the agricultural sector, the level of poverty in this sector remains high compared to other sectors in the economy. The livelihoods of agricultural households are vulnerable to climatic uncertainties which also imply income uncertainties. Consequently, there is a need to diversify into non-farm activities as a safety net. This is especially true for households who are faced with substantial crop and price risks. Failure to understand the determinants of activity participation as well of the income derived from these activities could lead to failures in policies designed to promote alternative income strategies that would provide rural households with greater access to opportunities which are made available by an expanding non-farm sector. Given the growing and continued importance of non-farm income to rural households there is a need to examine the factors that have motivated agricultural households in selecting a livelihood strategy that involves diversification into non-farm activities.

The ability of rural households to secure employment in the non-farm sector is highly dependent on their asset endowments. Households are often involved in a portfolio of activities which is a result of various combinations of assets and activities which will in turn determine the livelihood strategies that they pursue. However, research into livelihood strategies and the feasible set of strategies which rural households can choose from, is lacking within the Malaysian context. The numerous constraints faced by rural households and the variety of non-farm employment opportunities that are available to them have caused great variations in livelihood diversification strategies. This heterogeneity has resulted in the difficulty of generalizing livelihood strategies. As a consequence, it has also been acknowledged as part of the reason for the lack of knowledge on the non-farm economy. Research into possible clusters of livelihood strategies which reflects the allocation of assets to these clusters of activities would then be important as it would enable the determination of

household characteristics within particular types of livelihood strategy. The identification of household characteristics would offer important insights as to what sorts of interventions might be effective in reducing the level of inequality and vulnerability among rural households.

As rural households become more involved in non-farm activities, this would imply that they will have a diversified portfolio of income generating activities consisting of a variety of agricultural and non-agricultural activities. This will have important distributional implications. Inequality is important to both poverty and growth. Differences in asset endowments will determine the concentration of non-farm income among the low and high income households. In view of the differences in asset endowments and the heterogeneity of activities, this may lead to an improvement or a worsening of inequality in rural areas and the inequality within the Bumiputera ethnic group, especially the Malays, who has the highest within group inequality and as most of the rice farmers are Malays. Previous studies have found an uncertain effect of non-farm income on the distribution of income as these effects depend heavily on country specific conditions. Consequently, it is imperative that a study looking into the effect of non-farm income on income distribution within the Malaysian context be carried out. This is to enhance the role of non-farm employment as a possible way of reducing the level of rural inequality.

1.3 Research questions

In view of the inability of farming income alone, in providing an adequate means of survival in rural areas and the problems identified in the problem statement of the study, the following research questions and objectives are to be addressed by this study.

a) Do low and high income households differ in terms of their involvement in non-farm activities and the types of income earned?

b) What are the clusters of livelihood strategies in the community?

c) Do income sources differ between the livelihood clusters?

d) What are the determinants of household selection of each identified livelihood clusters?

e) What are the determinants of income levels and income shares from each source of income?

f) How does non-farm income affect the distribution of income among farm households in general and in each identified livelihood cluster?

g) What are the household assets that affect the contribution of the inequality in each income source to total inequality and the inequality in each livelihood cluster?

1.4 Research aims and objectives

In general, the aims of the study are to examine the income diversification of rural households and to analyze the effect of non-farm income on overall income distribution. The specific objectives of the study include:

a) To determine the income structure of rural households.

b) To identify the main livelihood clusters among rural households.

c) To describe the livelihood clusters of rural households, in terms of their assets and incomes generated from the chosen livelihood cluster.

d) To identify the determinants of income levels and income shares for each identified income sources.

e) To determine the implications of various income sources on the distribution of income among rural households.

f) To analyze the contribution of household assets to overall inequality and the inequality in livelihood clusters as well as the inequality in each income source.

1.5 Significance of the study

The heterogeneity in income diversification strategies among households sharing similar biophysical conditions has rarely been empirically investigated. Detailed community-level case studies are important in an effort to adequately address policy concerns about poverty and inequality. This is in view of the recognition of the rural non-farm sector as an effective instrument for alleviating poverty, providing job opportunities and reducing income inequality in rural areas. The sector also has the potential to absorb the surplus labor from a growing rural population, reduce rural-urban migration, and contribute to the growth of national income (Davis, 2004; Islam, 1997; Lanjouw & Lanjouw, 2001).

Studies on the role of non-farm activities on total household income are mainly focused on Sub-Saharan Africa, Latin America, and Asia especially China, India, and Pakistan. A majority of these livelihood studies are based on households living in areas with poor infrastructure, underdeveloped goods, and land markets, and mountainous topographies with serious soil erosion problems. Despite the importance of the non-farm sector as indicated by these studies, there is relatively scant knowledge about non-farm activities and the role they play in the income generating strategies of rural households in Malaysia, especially for rural households located in a developing rural area and in an area that is well equipped with irrigation infrastructure. Despite higher household income, these communities are still vulnerable to weather and price changes which are very much dependent on what is happening in the global economy and environment.

Another area that is lacking research is the effect of non-farm income sources on the distribution of income among rural households.

This study adds some new insights about the role of non-farm employment on both income diversification and income distribution in a relatively developed rural area of Malaysia. The existing studies of household participation in non-farm employment have utilized only a few categories of household assets, in particular human and natural capital. The inclusion of the effects of other categories of household asset endowments on the choice of non-farm employment and hence the livelihood cluster, would provide a greater understanding of rural household participation decision into non-farm employment. This would provide policy makers with some indication of intervention possibilities which will have to take into consideration the various barriers faced by rural households in order to enable them to participate in higher return activities.

Livelihood research is fairly new in Malaysia. Recent studies by Norsida and Sadiya (2009) in the granary areas of Kemasin Semerak in Kelantan and Muda in Kedah and another study by Terano and Fujimoto (2009) in the granary area of Seberang Prai were carried out to determine the factors that affect a household's participation decision into non-farm employment. However, the findings from these studies are based on the sample as a whole rather than the possible livelihood clusters that may differ in terms of household asset endowments. There was also a lack of analysis on the income aspect of diversification. Therefore, this current study is basically a combination of livelihood and distributional studies, which is a growing area of research in development economics but still lacking in rural development studies in Malaysia. The livelihood studies in Malaysia have not been able to fully explain the real picture of the non-farm sector in less poverty prone area, where farm activities are mostly mechanized and non-farm activities are relatively developed and diversified. Although most of the farmers in these areas are not poor but they are categorized as low income households who are still

vulnerable to poverty. Livelihood studies are basically focused on the poor rather than the low-income group. This study would, therefore, contribute towards greater understanding of livelihood strategies of low-income groups in a rural community.

In addition to providing empirical information that is useful to policymakers and other stakeholders, in particular those that are related to rural development and paddy production in Malaysia, this study makes a methodological contribution to the largely qualitative livelihood strategies literature through the development of a quantitative application of the livelihoods approach. The clustering of households into several income diversification clusters will provide a characterization of the heterogeneous paddy farmers in a granary area. This would enable a better understanding of rural household income diversification behavior which is essential to future assessment of the likely impact of future structural changes on rural income diversification.

The identification of distinct livelihood strategies will enable the identification of the determinants of household access to the most desirable livelihood strategies. Diversification choices are assumed to reflect the optimal strategies chosen by farm households that will balance the expected returns with the related risk. Diversification strategies may not be equally lucrative, hence understanding both the incentive and the constraints that rural households face in their selection decision of a livelihood strategy would provide important insights as to the type of policy that might be effective in improving the poor and low income rural household access to higher return activities (Démurger, Fournier, & Yang, 2010). Recent livelihood studies in Malaysia have only analyzed the factors that have lead to the participation of rural households in non-farm activities but without any identification of distinct livelihood strategies. This would make the planning and implementation of interventions ineffective in facilitating movement to more desirable livelihood strategies, which will result in the improvement of the well-being of household members.

The fact that rural households are not a homogeneous group indicates that the inequality within this group cannot be treated as a single problem that can be solved with a uniform package of policy measures. Consequently, the analysis of specific attributes and asset combinations of different livelihood strategies will enable a policy analysis that is better targeted to subgroups of paddy farmers. The contribution of this study lies in the identification of different livelihood profiles for rural households in a developed Malaysian granary area as it provides information on what rural households currently consider as their most attractive options. Furthermore, an understanding of the differences behind specific livelihood profiles is a prerequisite for effective rural policy implementation (Ansoms & McKay, 2010).

This study contributes to the literature on income inequality in rural Malaysia in a number of ways. It represents an early attempt to analytically identify the fundamental determinants of rural income inequality in Malaysia. The use of regression-based decomposition is novel in that it allows ranking of these determinants according to any inequality measure. Moreover, the household level data used in this study complements the existing literature which is mostly based on aggregate data.

Previous income distribution studies in Malaysia such as those by Anand (1983), Ikemoto (1985) and Shireen (1998) have mainly been focused on the distribution of income for the country as a whole with comparisons by state, stratum (rural/urban) and ethnic groups. It has been acknowledged that there is a declining trend in overall and urban income inequality. However, rural income inequality has increased in recent years. The within group inequality, in particular, among Bumiputera, has been identified as a probable cause for the increase in rural inequality. Nonetheless, previous inequality studies were based on poverty-prone areas. Therefore, they were not able to fully explain the level of inequality in less poverty-prone areas where the non-farm activities are relatively developed and diversified in its contribution in household income.

Furthermore, these studies have analyzed income as a whole without taking into consideration the specific components of a household income. In reality, a household's income may come from various sources, either from labor or non-labor income. The share of each income source would probably be different in total household income and may not be distributed equally throughout the population. As a consequence, issues such as the size of the effect and the contribution of the inequality of these income sources to total inequality require investigation.

Studies on the effect and contribution of each income source on total inequality if very lacking in Malaysia. Roslan (2000) has performed this type of inequality decomposition study; however it was based on the total income of the population without any decomposition of total household income by rural and urban areas. This study is therefore, an effort towards the enhancement of understanding on the rural and within group inequality in Malaysia. This is achieved through the analysis of the level of inequality and the contribution of non-farm income to the level of inequality in rural areas and among rice farmers with a majority of them being Bumiputera.

Micro level studies on the effect on non-farm income on the distribution of income in selected rural areas of Malaysia have also found that non-farm income has an ambiguous effect on income distribution (Fredericks & Wells, 1978; Ishida & Azizan, 1998; Shand, 1987; Siti Hadijah, et al., 2012; Terano & Zainalabidin, 2011). The inequality focus of the studies in the 70's, 80's and 90's have basically been on the measurement of the level of inequality for net paddy income, net farm income and total household income, by using the Gini coefficient and concentration ratio. The more recent studies have extended the decomposition to include the decomposition of overall inequality into the respective income sources which include non-farm income. The decomposition also enables the determination of the contribution of each income source to total inequality and the determination of whether each income source increases or

decreases overall inequality. However, none of these studies has linked household asset endowments to the level of inequality in general and more specifically to livelihood clusters.

In view of the lack of studies that relate household asset endowments to the level of inequality, this study extends the inequality decomposition by household assets using a regression-based method. Not much is known about the determinants of the level of income inequality, especially of those related to the distribution of income resulting from the selected livelihood clusters in rural areas. Such knowledge would be important for policy purposes as it would enable policy makers to decide on relevant policies to implement. Knowledge on factors that determine income inequality would reveal whether the existing inequalities are due to household asset endowments which can be changed through policy by broadening access to such factors or due to other unchangeable characteristics. The inequality decomposition aspect of this study is relevant to the enhancement of knowledge of determinants of rural income inequality in Malaysia.

1.6 Scope and limitation

There are two main components to this study (i) the clustering of households into livelihood strategies and (ii) the effect of non-farm income on the distribution of income in a rural community. Clustering is performed to determine the types of livelihood strategies in order to identify distinct livelihood strategies and the correlates of access to the most desirable of those livelihood strategies. Although there are eight main rice producing areas in the Northwest Selangor IADA, the study is carried out on only two areas, namely Panchang Bedena and Bagan Terap due to logistical reasons. These two areas are selected for the study due to their location at the tail end of the irrigation network where despite the availability of irrigation water for double cropping,

farmers in these two areas are more vulnerable to water shortages, which affect their off-season yield.

The study utilizes household income data which has often been challenged by the instability of annual income and recall problems. However, the present study requires the use of income data due to the second component to the study, which is income distribution. The use of income data is required in order to identify the various income sources of households in the sample. The share of each income source in total household income is also required in the clustering of livelihood strategies that involves the mapping of household assets to the respective livelihood outcome, which is household income. Data on household consumption is not collected as this study does not include an analysis of household welfare.

The analyses in this study are based on data from two crop seasons. Therefore, the resulting livelihood clusters will only provide a one shot scenario of household income diversification behavior. It does not provide any indication of livelihood improvements for households in the study area, as improvement occurs over an extended period of time. There were also no unfavorable weather conditions or other shocks that may affect paddy yields during the study's survey period. These shocks may affect paddy yield and hence household income from paddy cultivation. Consequently, this will result in different livelihood clusters and level of income inequality in the study areas.

1.7 Chapter Arrangement

There are seven chapters in this thesis. Chapter 1 provides the background to the study. It discusses the research problems, provides the research aims, and lists the research questions and objectives. The significance of the study as well as its limitations is provided in the final section of the chapter. Chapter 2 presents the stages of

development of the rural non-farm sector; an overview of the Asia-Pacific rural non-farm sector; and an overview of the Malaysian non-farm sector.

Chapter 3 includes discussions involving concepts of livelihood strategies, motives of diversification and reviews the theoretical and empirical literature on the determinants of income generating activities of rural households. In particular, this chapter reviews the empirical evidence of household participation in off-farm activities, livelihood strategies, the effect of various household assets on income generating activities, the effect of non-farm income on poverty and income distribution, and the effect of household assets on income inequality.

Chapter 4 describes the research methodology of this study. The sampling frame and the selection of households are also provided. This is followed by the identification and measurement of the dependent as well as the independent variables used in the analyses. The final section of the chapter provides an explanation of the methodology used in the cluster and income distribution analyses. It describes the different econometric models used in analyzing the selected variables on total household income, various income sources, selection of livelihood clusters, and income inequality.

Chapter 5 presents the results of the descriptive analyses of income and activities of rural households in the whole sample. This is followed by the description of livelihood clusters, in terms of income shares and household assets as well as the analysis of the determinants of household selection of a particular livelihood cluster. Chapter 6 looks at the distribution of income where a Lorenz curve is derived to graphically show the income distribution together with the calculation of the Gini coefficient. The analyses of the results from the decomposition of the income inequality by income source, livelihood clusters, and household assets are provided in the final section of this chapter.

Chapter 7 provides a summary of findings from the cluster and income distribution analyses. It is based on the objectives of the study which are basically on the effect of household assets on household income diversification decision and the effect of non-farm income on income inequality. The discussion will also relate to the conceptual and theoretical foundation of the study. In addition, this chapter also discusses the implications of this study on policies relevant to income distribution issues. Finally, a few suggestions with regard to future research direction in this area of study are also provided in this chapter.

CHAPTER 2

DEVELOPMENT OF THE NON-FARM SECTOR

2.1 Introduction

It has been widely accepted in the development literature that in the process of structural economic transformation that accompanies economic development, the farm sector as a share of a country's GDP will decline as its GDP grows (Chenery & Syrquin, 1975). In rural areas, this would imply a shrinking agricultural sector and an expanding rural non-farm sector (Davis, et al., 2007). Reviews have provided empirical evidence of the existence of a large rural non-farm (RNF) economy (Davis, et al., 2007; Haggblade, et al., 2005; Lanjouw & Lanjouw, 2001; Reardon, et al., 2001; Reardon, et al., 1998).

The RNF economy is gaining greater importance in the debates on rural development, in particular, issues related to the role of non-farm income on poverty and income distribution. The livelihood strategies of rural households, and therefore, the rural economies are increasingly becoming more diversified. However, not much is known about the development and impacts of the RNF economy. This chapter begins with the explanation of the distinct stages of development in the RNF economy. The understanding of these stages is important in designing policy interventions. This is followed by an overview of the Asia-Pacific RNF economy and the Malaysian non-farm sector.

2.2 The development stages of the rural non-farm economy

Traditionally, the RNF sector has been viewed as a low-productivity sector which produces non-tradable goods that are of low quality and it is expected to wither away as a country develops. Hymer and Resnick (1969) developed the first model of an

agrarian economy with non-agricultural activities to explain the hypothetical decline of RNF activities in the colonial era. Non-farm occupations were regarded as residual activities in rural areas. The model assumes an initially self-sufficient economy producing agricultural goods as well as other goods and services, which was labeled Z-goods, for local consumption. These goods are inferior goods and services as well as low-productivity manufacturing which will decrease in demand as rural income increases. These types of activities include the manufacture of baskets, parts and other implements for local domestic use, traditional mills, trade and local fairs as well as transportation firms to neighboring towns.

As a rural economy develops there will be greater market integration and trade with the mainstream economy which will lead to greater specialization in agriculture and hence displacement of the Z-goods sector. Colonialism provided new export opportunities for cash crops and natural resources, as well as increasing the supply of cheap and higher quality manufactured goods through imports. Competition from imports and the movement of labor into the growing cash crop sector would stifle rural non-farm activities. Therefore, non-farm activities and rural industries, in particular, cannot act as a source for rural development.

The Hymer-Resnick model was later criticized by Ranis and Stewart (1993). They have argued that the application of the Hymer-Resnick model was intended primarily for the colonial era, and that the assumptions of the model were not universally applicable, either with respect to the changes in the terms of trade or the inferior character of Z-goods. This is especially true when the model is extended to the post-colonial era. The Hymer-Resnick analysis was extended by introducing a two part Z-goods sector, with part of the sector producing traditional goods and services (*traditional Z goods*) in households and villages and the other part producing more modern activities (*non-traditional or modern Z-goods*) which are located in towns.

From the consumer's viewpoint, modern Z-goods are comparable in quality to imports or urban-produced goods as they are produced using more sophisticated technologies that requires greater skills and are more capital intensive. With the increase in productivity of non-traded agriculture such as staples, the modern Z-goods production in the rural economy also expands together with export-oriented agriculture. The macro and micro policies in the model were shown to determine whether an economy will follow a balanced growth pattern which includes an active Z-goods sector or a displacement of the Z-goods sector by imports or by subsidized urban goods.

The expansion of the rural non-farm sector was also observed by other studies. It has been argued that rural non-farm activities and rural industries play an important role in rural development. Non-farm activities and rural industries do create rural employment, reduce rural poverty, slow down rural-urban migration, and promote rural development in general (Anderson & Leiserson, 1980; Ho, 1986; Lanjouw & Lanjouw, 2001; Reardon, et al., 1998; Winters, et al., 2009). Lanjouw and Lanjouw (2001) in their review of the non-farm sector in developing countries suggested that employment and income shares of the non-farm sector have on the whole been growing. In their most favorable scenario, the Z-goods sector is able to grow by adopting modern and more productive technologies, thus enhancing the backward and forward linkages between agriculture and the RNF sector (Isgut, 2004).

Indeed empirical evidences from most developing countries do suggest a growing share of household income from non-farm sources. The share of non-farm income has amounted to between 40 percent and 45 percent of average rural household income in sub-Saharan Africa and Latin America and between 30 percent and 40 percent in South Asia. A significant share of the non-farm income comes from local rural employment rather than from migration to urban areas (Barrett, Reardon, & Webb, 2001; Lanjouw & Shariff, 2004; Reardon, 1997; Reardon, et al., 2001). Such a

development in income diversification will transform the structure of rural economies and societies. In responding to this change and in determining the relevant policy interventions in order to support the growth of the rural non-farm sector, policy makers should have greater understanding of the dynamics of diversification and evolution of a RNF economy.

The analysis on the growth of the RNF activities should not be done in isolation from agriculture. This is because they are linked through investment, production, and consumption throughout the rural economy and both form part of the livelihood strategies adopted by rural households. Furthermore, different income generating activities offer alternative pathways out of poverty as well as a mechanism for managing risk in an uncertain environment.

There are three distinct stages in the development of the RNF economy - growth, demise and recovery (Start, 2001). In order to ensure the achievement of the desired outcome of any implemented policy for rural development and poverty alleviation, policy interventions should therefore be developed to meet the particular requirements of RNF activities at each stage of development of the RNF economy. In explaining the growth path of the RNF economy, Start (2001) suggested a four-stage model. The model basically explains the evolution of an agriculturally driven growth of RNF activities through the production and consumption linkages between farm and non-farm sectors, as presented in Table 2.1.

As summarized in Table 2.1, 'Stage One' is characterized by a traditional economy which is both rural and subsistence in nature. This implies low urbanization level and a small RNF economy which is dominated by service provision. As the agricultural sector as well as other economic sector grows, the RNF economy will also grow and modernize in 'Stage Two'. There will be greater growth in productivity

resulting in the production of surpluses and hence higher incomes. This will enable further rural diversification and growth of the RNF economy. As development continues into ‘Stage Three’ there would be greater urban competition. Higher rural incomes, which translate into higher purchasing power, preference for urban products and services, reduced transport and transaction costs, and the erosion of protective barriers to rural markets due to the development of greater infrastructural facilities, will reduce the growth of the RNF economy. Finally, in ‘Stage Four’ as the economic and social costs of urban congestion grow new types of RNF activities may develop through greater outsourcing or clustering arrangements. As rural-urban linkages develops, urban producers become increasingly more dependent on small, sub-contracting and decentralized enterprises in both rural locations and small townships. This, in turn, will provide more opportunities to rural workers and producers to link with urban industries.

The growth, demise, and recovery model implies a sequential process and homogenous pattern of RNF economic growth across regions of a country. However, Start (2001) noted that different parts of the economy develop at different rates, and many rural areas will have different degrees of all the four stages concurrently, including migration to urban areas where production activities are located. The actual position and mix will depend on the levels of agricultural development, rural incomes, rural infrastructure, and urbanization. While the relevance of the four-stage model in explaining RNF economic growth process remains subject to potential strengths and weaknesses of the rural-urban linkages, this provides important guidelines for designing strategic interventions which is required at different stages of poverty-focused development process of the RNF activities.

Table 2.1: Stages of development in RNF economy

Stage of development	Stage of agricultural development	Level of rural remoteness	Level of urbanization	Locus of non-farm production	Level of RNF economy technology, capitalization & returns
One – Traditional	Pre-modern & subsistence	High	Low	Rural (RNF economy limited by low purchasing power)	Low: Traditional subsistence products
Two – Locally linked	Initial technology-led agricultural growth	High	Low	Rural (RNF economy expands through agricultural-led growth)	Low to Medium: Some technology & capital improvements
Three – Leakages to urban areas	Improved urban marketing	Low (new roads open urban markets)	Low	Urban (RNF economy competed away by urban goods & services)	Medium to High: As urban location allows investment & economies of scale, RNF economy must modernize to survive
Four – New urban linkages	Increasing urban demand	Low	High (congestion & costs rise)	Shift to Rural: Flexible specialization able to exploit rural advantage	Low to High: From cottage industry out-workers to modern 'clustered' & sub-contracted units

Source: Start (2001)

Reardon et al. (1998) also provide support to the growth model of RNF economy by Start (2001). The term "stages of RNF sector transformation" is used to explain the general pattern of variations in the nature of RNF activities which tend to differ significantly over regions and sub-regions. Three stages of the RNF sector transformation are proposed. Africa and South Asia are considered to be in the first stage of the RNF sector transformation based on the patterns in the levels and composition of RNF activities. The first stage is dominated by RNF activities that are mostly based on local agriculture, in particular farming; hence most of the RNF activities are located in rural areas and are not very dependent on linkages with urban areas. A majority of the population are employed in the agricultural sector, especially in

traditional labor-intensive activities which use little modern equipment. The agricultural activities are dependent on local supplies for farm inputs and services such as processing and distribution of farm products. These services are usually provided by small and medium-scale local firms. The RNF activities are mainly home-based and small-scale in nature with the production of non-tradable goods, which are mainly produced and sold in local markets. Examples of dominant activities at this stage include fertilizer manufacturing and mixing, tractor services, transportation, crop processing, construction or maintenance of market facilities, and commerce.

The second stage of the RNF sector transformation is observed for Latin America. In this stage, semi-modern RNF activities develop as a result of greater linkages between the farm and non-farm sectors. There is greater agricultural diversification and development of service sector activities that are still based on agriculture as well as other services that have no linkages with agriculture such as mining and tourism. There is greater participation of rural households in non-farm activities hence reducing the share of employment in agricultural activities. The greater participation in RNF employment which resulted from the development of a stronger farm/non-farm linkage in the second stage of transformation is also partly due to the growing sub-contracting arrangements of rural companies by urban or foreign businesses, especially in the production of light durables such as clothing. The increase in the number of rural labor that is willing to commute from the countryside to rural towns as well as intermediate cities also strengthens the farm/non-farm linkages. There is also a rapid growth in agro-industrialization in commercial agricultural areas especially on a medium and large scale. This stage is also characterized by a mix of capital intensity, where both the small-scale labor-intensive production in the countryside and the relatively capital-intensive enterprises are producing the same output in local intermediate cities.

East Asia appears to be in the third stage of RNF sector transformation. In the third stage, there is greater intensification of the characteristics in the second stage of transformation. There are greater rural-urban linkages as shown by greater sub-contracting arrangements and willingness to commute. In sub-contracting arrangements there are greater tendency for sub-contracting involving medium durables, such as vehicle parts, in addition to light durables. During the third stage, there is substantial agro-industrialization in commercial agricultural areas and employment in sectors that are completely unrelated to agriculture.

The development and transformation stages by Start (2001) and Reardon et al. (1998) basically reflect the increasing diversification of rural employment. The evidences in Malaysia suggest that rural households participate in a wide range of non-farm activities, both in wage and self-employment in manufacturing, trade, and services. The rural economy has witnessed increasing diversification as reflected in the increase in the RNF sector employment from 17 percent in 1985 to 87 percent in 2010.

2.3 Development stages of RNF economy and policy implications

What are the policy implications of the differences in stages of development of the RNF sector? Any interventions that are intended for the expansion of the RNF sector have to take into consideration the differences in the stages of development in each area. In remote rural areas with traditional agriculture, the type of intervention should be more focused on the development of a linkage-rich, small-scale agriculture that will stimulate the diversification of the rural economy. The RNF sector will then be able to supply the growing need of an agricultural economy that is too remote to be serviced efficiently by goods and services from surrounding urban areas (Start, 2001). Examples of interventions for these areas include development of infrastructural facilities; investments in education, health and human resource; and establishment of credit,

capital and land markets (Reardon, et al., 2001). The entry points for such interventions are rural towns or growth centers, which provide a center for markets, services, and information as they are the link between rural producers and the sources of urban demand, and they also provide access to urban goods and services.

Areas with a developed agriculture and with efficient infrastructural facilities may be experiencing a decline in the traditional agriculturally-linked RNF economy due to competition from urban areas. Rural enterprises that have strong rural comparative advantage such as sub-contracting, sub-sectoral promotion and clustering can still be promoted, but the emphasis is on getting back investment from urban areas. This is to be achieved through utilization of cheap labor and resources as well as more flexible production arrangements.

Sub-contracting and out-sourcing are forms of rural-urban linkage that enable rural producers to have access to assured, high value markets. The urban-base firms may also benefit from such an arrangement as they are able to decentralize their production and processes to small-scale units and therefore would benefit from cheap, flexible contracts which do not require any need for managing an expensive, permanent urban workforce. This will result in greater integration of rural-urban mode of production, where the two sectors complement rather than compete with each other. In view of such benefits, strategies should be formulated with emphasis on the provision of opportunities that would link rural and urban producers. One such approach is through the promotion of greater producer group activities and trade associations that would enable small producers to experience economies of scale in areas such as procurement, credit, marketing, quality control, and lobbying.

In more developed agricultural areas the government's assistance is important in capacity-building, start-up costs, or technical assistance. However, government-created

organizations are more prone to failure and hence the need to be focused on providing services for their clients' need where a cost-recovery provision should be built in to ensure this. If the intended sub-sector is still very small, the biggest danger is the creation of a supply-side push of credit and subsidy that is unsustainable and does nothing to address demand-side realities (Mahajan, 1993).

The development of business clusters will enable cluster members to benefit from their close proximity to one another. Some of the possible benefits include personalized contracts, reduction of transaction costs; facilitating information exchange; and subdivision of component production and processes, and often with sub-contracting within the cluster and incremental technological advancement (Schmitz & Nadvi, 1999). The relevance for rural areas is that such clustered development, often in rural towns, may be able to retain most of the collective efficiencies enjoyed by larger urban areas. However, in a network of growth centers that are specialized sectorally and regionally decentralized, it is debatable how easily policy interventions can enhance the development of new clusters, particularly in rural areas where clustering of activities is less common (Start, 2001).

Given the development stages of the RNF economy, policy makers are faced with the challenge of how to assure that the growth of the RNF sector can be used to the advantage of poor households and how to identify the mechanisms to best exploit the linkages between the agriculture and non-agriculture sectors. Although agriculture continues to play a central role in rural development, the promotion of other sources of rural growth engines such as the rural non-farm sector is also crucial. Nevertheless, the poverty and inequality implications of promoting RNF activities are not directly observable. They depend on the poor's access to RNF activities, the potential returns to RNF activities, and the share of RNF income in total household income. The ability of poor or low income households to participate in higher return RNF activities may be

limited due to entry barriers such as liquidity and human capital constraints. If this is the case then a vicious circle may be established where poor households are confined to low return RNF activities that serve as coping strategies rather than as a path out of poverty. The promotion of RNF activities may then leave poor households behind and worsen income inequality (Davis, et al., 2007).

2.4 The Asia-Pacific non-farm sector

Empirical studies on income diversification in developing countries have mainly been focused on Sub-Saharan Africa and Latin American countries. There has not been much research on rural income diversification behavior of rural households in developing countries in the Asia-Pacific region. This section presents an overview of the pattern of income diversification in this particular region.

Most countries in the Asia-Pacific region are characterized by high population growth, widespread rural poverty, increasing income inequality, greater rural-to-urban migration, as well as reduction in farm sizes and productivity. This has made the development of the RNF sector as crucial to the provision of sustainable livelihood opportunities and poverty reduction in rural areas. As the population increase in land-scarce areas, the growth of the agricultural sector cannot be expected to absorb the growing rural labor force. The relatively small urban industrial sector has also failed to provide employment opportunities to the labor force that have been released from the agricultural sector. Therefore, the RNF sector is important to the provision of employment opportunities to these excess agricultural labors (Ahmed, 2006).

The most common indicator of the relative importance of the RNF economy is the income shares from RNF activities. Table 2.2 shows the share of income from non-farm activities in rural areas of selected countries in the Asia-Pacific region. The share of income from the non-farm sector is high and substantial in most of the countries. In

the Philippines, the share of non-farm income is the highest accounting for 58 percent of total household income. The lowest share is for Indonesia which has a non-farm income share of 40 percent. However, according to Singh (2010), this can still be considered as an important contribution.

Table 2.2: Income shares from non-farm activities in rural areas (Selected Asia Pacific countries)

Country	Year	Percentage
Afghanistan	2005	45.0
Bangladesh	2005	43.8
India	2005	47.0
Indonesia	2000	40.0
Philippines	2000	58.0
Sri Lanka	2005	56.4
Thailand	2000	44.0
Vietnam	2004	41.7

Source: Singh (2010)

The sector-wise absorption of labor force is given in Table 2.3. The pattern shows that agriculture continues to be an important sector for providing employment compared to the industrial and service sectors. It is shown that the agricultural sector still has a high labor force participation in countries such as Cambodia (72 percent), Nepal (66 percent), as well as Vietnam and India with 52 percent and 51 percent respectively. On the contrary, in some countries, the labor force participation is higher for the industrial and service sectors. Hong Kong has the highest labor force participation in these two sectors with almost 100 percent participation of its labor force. This is followed by Malaysia and Sri Lanka with 86 percent and 67 percent respectively. Thus for these countries the labor force have shifted to the industrial and service sectors which implies lesser dependence on the agricultural sector. Cambodia has the lowest employment in these sectors with only 28 percent. A greater participation of households in the industrial and service sectors means that there is a need to expand

and diversify the opportunities available in these two sectors in rural areas in order to achieve a sustainable livelihood.

Table 2.3: Distribution of employment by sector in selected Asia-Pacific developing countries

	Employment by sector						
	Agriculture			Industry		Service	
Country	Total	Male	Female	Male	Female	Male	Female
Bangladesh (2005)	48.1	41.8	68.1	15.1	12.5	43.0	19.4
Cambodia (2008)	72.2	69.3	75.0	8.1	9.0	22.6	15.9
Hong Kong (2007)	0.2	0.2	0.1	21.3	5.9	78.5	94.0
India (2010)	51.1	46.2	65.3	24.0	17.7	29.8	17.0
Indonesia (2010)	38.3	39.0	38.0	22.0	15.0	40.0	47.0
Malaysia (2008)	14.0	16.7	9.0	32.0	22.7	51.3	68.3
Mongolia (2009)	40.0	41.2	38.7	18.6	10.9	40.2	50.4
Nepal (2001)	65.7	60.2	72.8	13.1	13.7	26.4	13.3
Pakistan (2008)	44.7	36.9	75.0	22.1	12.2	40.9	12.9
Philippines (2009)	35.2	42.3	24.0	17.5	9.9	40.4	66.0
Sri Lanka (2009)	32.6	30.4	36.6	25.0	25.3	27.2	27.1
Thailand (2009)	41.5	43.7	39.0	21.2	17.6	26.0	43.3
Vietnam (2006)	51.7	49.6	53.8	24.4	15.9	26.0	30.3

Source: Compiled from World Bank Data (World Development Indicators)

In terms of the distribution of employment by gender, female workers are mostly found in the agricultural sector. In contrast, there is more male labor participation in the industrial and service sectors. The exception is for Hong Kong where 94 percent of the female labor force is in the service sector and only 0.1 percent in the agricultural sector.

Land is a fundamental livelihood asset and poor rural households have been found to be more dependent on agriculture. However, the decreasing agricultural productivity and the lower profitability due to various risks associated with agricultural production have resulted in the need for income diversification. The growing rural labor force together with the decreasing capacity of the agricultural sector to absorb this growing labor force has contributed to the growth of the non-farm sector. Empirical evidence suggests that rural households are indeed involved in multiple income-

generating activities and they rely on a diversified income portfolio. This also suggests a reduction in household dependence on agriculture for employment and as the main source of income. Consequently, this enhances the growth of the non-farm sector and the share of income from non-farm activities.

Table 2.4: Status of arable land

	Arable land (sq. km)	Agriculture land (% of land area)		Arable land (% of land area)	
Country	**2009**	**1990**	**2009**	**1990**	**2009**
Bangladesh	130,170	79.8	70.3	72.6	58.1
Cambodia	176,520	25.2	31.5	20.9	22.1
China	9,327,480	57.0	56.2	13.3	11.8
Hong Kong	1,042	NA	NA	NA	NA
India	2,973,190	60.9	60.5	54.8	53.1
Indonesia	1,811,570	24.9	29.6	11.2	13.0
Lao PDR	230,800	7.2	10.2	3.5	5.9
Malaysia	328,550	22.0	24.0	5.2	5.5
Mongolia	1,553,560	80.9	74.5	0.9	0.6
Myanmar	653,520	16.0	19.0	14.6	16.9
Nepal	143,350	29.0	29.6	16.0	16.7
Pakistan	770,880	33.6	34.1	26.6	26.5
Philippines	298,170	37.4	40.1	18.4	18.1
Sri Lanka	62,710	37.3	41.6	14.4	19.1
Thailand	510,890	41.9	38.7	34.2	29.9
Vietnam	310,070	20.7	33.1	16.4	20.3

Source: Compiled from World Bank Data (World Development Indicators)

As implied above, the potential of the agricultural sector to absorb the rural labor force is partly dependent on the availability of arable land. Table 2.4 shows that the availability of arable land as a percentage of total land area in most of the selected Asia-Pacific countries is quite small, except for Bangladesh and India. The lowest percentage of arable land is about 0.6 percent (2009) in Mongolia followed by Malaysia with 5.5 percent. Surprisingly, 40 percent of the labor force in Mongolia is engaged in the agricultural sector although the country has the smallest percentage of arable land. In general, there is a declining trend in the availability of arable land as well as the proportion of land for agriculture in the selected countries despite the increase in percentage of arable land in most of the countries from 1990 to 2009. This declining

trend indicates greater migration to urban areas for employment and as a means of earning a living.

2.5 The Malaysian non-farm sector: An overview

This section presents a more specific discussion of the non-farm sector in Malaysia, which is also well-known for its heterogeneity as in any other country. At one extreme, there are the rural industries consisting of industrial estates and agro-processing industries, which can be quite large in scale. At the other extreme are the part-time and seasonal non-farm activities that are household-based or cottage industry among marginalized farm households. Between these two extremes are varieties of full-time operations that tend to be specializing in some form of non-farm activities such as traditional handicrafts and other non-farm work that are made available as a result of economic growth. These non-farm activities may be different in terms of organization and ownership (Saith, 1989). As a consequence of this diversity, it is difficult to provide a precise definition of a non-farm sector. There is also no universally accepted definition of RNF activities; hence the definitions tend to differ according to country-specific conditions (Lim, 1985). Within the Malaysian context, rural non-farm activities include manufacturing, repairing, and other production-related activities such as commerce, transportation, public utilities, and other non-agricultural production activities that are carried out in rural areas, which are defined as areas with population clusters of less than 10,000 people (Lim, 1985).

Saith (1989) in a review of RNF activities in Malaysia defined non-farm activities as any rural activities that do not directly relate to agricultural production, that utilizes rural labor and generate incomes, regardless of whether it is conducted on one's own farm or someone else's farm or totally off any farms. Therefore, this does not include hired agricultural labor, although it is off-farm. However, activities involving

domestic cottage industry, though it is performed on-farm are included as non-farm activities.

Previous reviews of the non-farm activities in Malaysia by Lim (1985) and Saith (1989) have been based on information from various Population Censuses which have been carried out by the Department of Statistics. With greater availability of annual employment data from various Labor Force Survey Reports, also by the Department of Statistics, the review of the Malaysian non-farm sector in this section is made based on these reports instead. These reports are also preferred due to the changes that have been made to the categorization of industries and occupational groups which have been continuously updated as the economy grows.

Since its independence in 1957, the Malaysian economy has continued to experience significant structural changes. The structural change has resulted in the shift of reliance from agriculture to industries and services. As experienced by other developing countries, the shift of emphasis is an important factor that has contributed to the diversification of household income. The economic growth experienced in the 1960s and 1970s had mostly been concentrated in a few urban areas with the development of industries. This has resulted in negative consequences for both rural and urban areas. The urban areas were experiencing serious problems of congestions and hence pollution as well as the development of slums. In rural areas, the industrial development has failed to eradicate rural poverty where underemployment was found to be common among rural communities (Lim, 1985).

Given the above scenario, there was a growing recognition that the RNF activities should be promoted and the process of industrial growth has to be integrated into poverty eradication strategies. The development of the RNF activities was also promoted as a way of increasing the standard of living of rural households. According

to Lim (1985), the RNF activities would enable the achievement of an economy that is both balanced in growth as well as the integration of the economy with a broad-based decentralized industrial structure. These activities could also provide employment opportunities to rural households hence reducing migration to urban areas.

Figure 2.1 shows the distribution of employed persons in the agriculture and non-agriculture sectors from 1970 to 2010. In general, there is a decline in the proportion of employed persons in the agricultural sector compared to those in the non-agricultural sector from 85 percent in 1985 to about 13 percent in 2010.

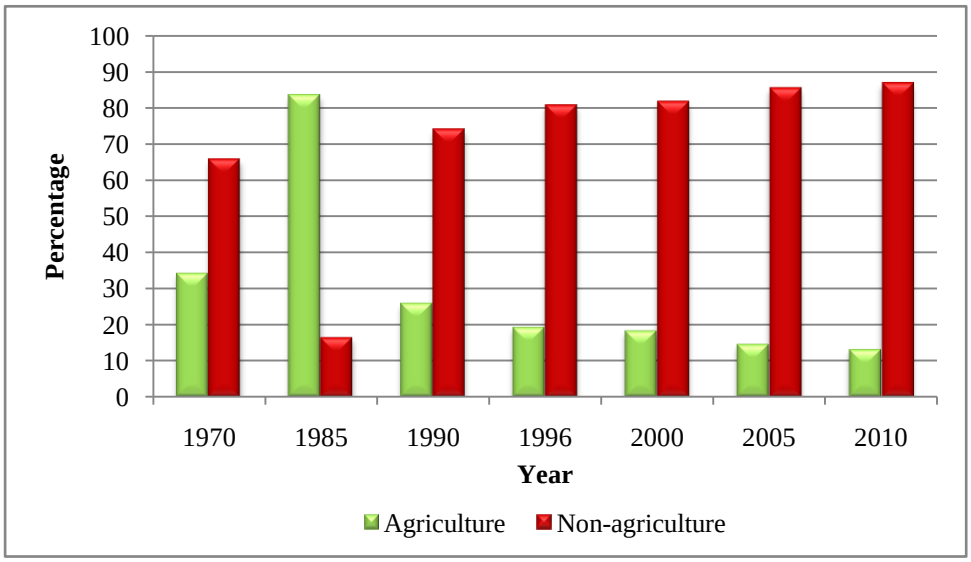


Figure 2.1: Distribution of employed persons by sector, 1970 - 2010

Table 2.5 presents a breakdown of the economically active population of Malaysia by industry of main occupation, differentiating between the share of employment in rural and urban areas. The table, however, does not differentiate between wage labor and self-employment activities. In 1996, about 81 percent of the economically active population of Malaysia was employed in the non-farm sector and this proportion has increased to 87 percent in 2010. The distribution indicates that the agriculture, forestry, and fishery group of industry is the main industry in terms of employment in rural areas, which accounts for 38 percent of rural employment in 1996 and 36 percent in 2010. This represents a reduction of about 7 percent in this sector's

employment. On the contrary, the non-agricultural industry groups provided employment to the bulk of the labor force in urban areas, which is about 97 percent in both years.

Table 2.5: Percentage distribution of employed persons by industry and stratum, Malaysia, 1996 and 2010

	1996			2010		
Industry	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Agriculture, forestry, livestock & fishing	19.4	2.9	38.4	13.3	2.7	35.8
Mining & quarrying	0.4	0.4	0.5	0.5	0.6	0.4
Manufacturing	22.8	24.1	21.2	16.9	18.4	13.7
Electricity, gas & water	0.5	0.6	0.4	1.0	1.1	0.9
Construction	8.5	10.1	6.7	9.2	9.7	8.1
Wholesale, retail trade, restaurants and hotels	18.7	24.0	12.4	23.5	26.7	16.7
Transport, storage & communication	4.8	5.7	3.7	6.2	7.3	3.9
Finance, insurance, real estate & business services	4.9	7.6	1.8	8.6	10.8	3.8
Community, social & personal services	20.1	24.5	14.9	20.9	22.8	16.8
Non-farm employment (%)	**80.6**	**97.1**	**61.6**	**86.8**	**97.3**	**64.2**
Total employed persons (000')	**8399.3**	**4506.7**	**3892.5**	**11129.4**	**7571.6**	**3557.8**

Source: Computed from Labor Force Survey Report, Department of Statistic, Malaysia (various years).

As of 2010, the main non-agricultural industry groups for both rural and urban employment are the service sectors of community, social & personal services (17 percent) as well as wholesale, retail trade, restaurants and hotels (17 percent) and the manufacturing sector (14 percent). In 1996, the manufacturing sector has the highest share of employed persons in rural areas. However, this employment share has decreased for both urban and rural employment. The services sector has gained more prominence in the share of employment in 2010. This is expected as the economy goes through a structural change with greater contribution of the service sector to the gross national product (about 58 percent as of 2011). The employment shares provided by Table 2.5 may only be a conservative estimate of the importance of non-agricultural

activities. This is because these figures may not include non-agricultural activities as a secondary activity.

The percentage of employed person in the agriculture, forestry, and fishery group of industry has decreased from 84 percent in 1990 to only 13 percent in 2010, which represents a drastic reduction in employment by 85 percent. This trend is also observed for both rural and urban areas. Other groups of industries have shown an increasing trend in terms of share of employment except for manufacturing, which has experienced a reduction in employment share by 26 percent.

A further breakdown of the share of employment data is presented in Table 2.6 where the participation of male and female workers is considered separately. The share of employment indicates that there is a decrease in male and female participation in the agriculture, forestry, livestock & fishing sector and an increase in the share of workers in the non-farm sectors.

The share of employed males in the agricultural sector has decreased from 21 percent in 1996 to 16 percent in 2010; while for female workers, the share is much smaller and has also shown a decreasing trend from 17 percent in 1996 to 9 percent in 2010. Because there is lesser involvement of women in agricultural activities, the non-farm sector accounts for a much larger share of total economic activities carried out by women compared to men. In both years, there is greater share of female workers in the non-farm sectors. In 1996, the share of female employed persons in non-farm activities has increased from about 83 percent to 92 percent in 2010. In contrast, the male employed persons in the non-farm sector employment are lower despite the increase from 79 percent in 1996 to about 84 percent in 2010.

Table 2.6: Percentage distribution of employed persons by industry and gender, Malaysia, 1996 and 2010

	1996			2010		
Industry	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
Agriculture, forestry, livestock & fishing	19.4	20.6	17.0	13.3	16.0	8.5
Mining & quarrying	0.4	0.6	0.1	0.5	0.7	0.2
Manufacturing	22.8	20.2	27.6	16.9	16.3	17.9
Electricity, gas & water	0.5	0.7	0.2	1.0	1.3	0.6
Construction	8.5	12.1	1.7	9.2	13.1	2.3
Wholesale, retail trade, restaurants and hotels	18.7	17.1	21.6	23.5	22.3	25.7
Transport, storage & communication	4.8	6.4	1.7	6.2	8.0	3.2
Finance, insurance, real estate & business services	4.9	4.4	5.9	8.6	11.5	3.4
Community, social & personal services	20.1	17.9	24.3	20.9	24.2	14.9
Non-farm employment (%)	80.6	79.4	83.0	86.8	84.0	91.5
Total employed persons (000')	8399.3	5514.2	2885	11129.4	7112.1	4017.3

Source: Computed from Labor Force Survey Report, Department of Statistic, Malaysia (various years).

Men and women are engaged in quite different activities as shown by Table 2.6 for the distribution of employed persons by gender, in general, and by Table 2.8 for the distribution by gender in urban and rural employment. In terms of importance, as shown by the percentage of employment share in each sector for male and female workers, it can be observed in Table 2.6 that as of 2010, while more than 25 percent of women who participate in the non-farm sector are involved in wholesale, retail trade, restaurants and hotels, only 22 percent of men are involved in such activities.

In an analysis of the distribution of economically active individuals in RNF employment (Figure 2.2), among rural workers, it was observed that there is greater similarity in terms of importance of each sector to both male and female rural workers.

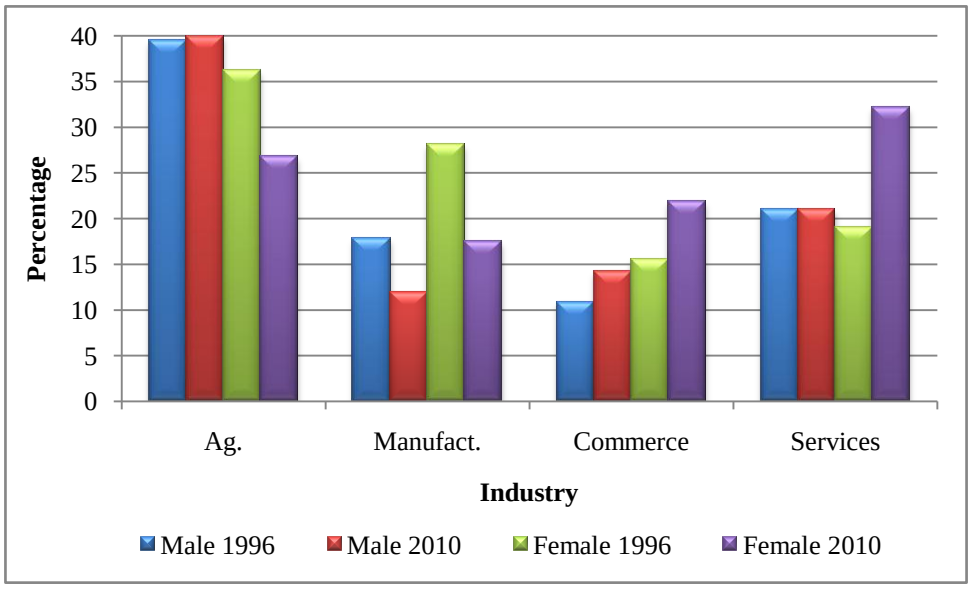


Figure 2.2: Distribution of rural employed persons by gender and industry

Source: Constructed from the Labor Force Survey Report, Department of Statistic, Malaysia (various years).

The employed rural women's share of RNF employment in 2010 is higher (73 percent) compared to rural men (60 percent). Between 1996 and 2010, the share of employment for women in RNF employment has been increasing from 64 percent to 73 percent. This represents a 14 percent increase in employment. However for men, there is a slight decrease in participation from 61 percent to 60 percent. This may be partly due to the slight increase in the share of employment in agricultural activities. This decrease is much smaller compared to the decrease in women's share of employment in agricultural-based employment with a reduction of 25 percent from 36 percent in 1996 to 27 percent in 2010. This indicates that for rural areas, there is greater participation of women in RNF employment and there is an increasing trend in participation.

In 2010, employment in the manufacturing; transport, storage and communication; electricity, gas and water; as well as mining and quarrying sectors have the same level of importance in terms of their ranks in the share of employment for both male and female workers. There is greater participation by women in (1) the

community, social and personal services (27 percent); (2) wholesale, retail trade, restaurants and hotels (22 percent); and (3) manufacturing (18 percent). For male workers, the important sectors in terms of participation are (1) wholesale, retail trade, restaurants and hotels (14 percent); (2) community, social and personal services (12 percent); (3) manufacturing (12 percent); and (4) construction (11 percent).

Table 2.7 shows a comparison of the occupational structure of the labor force in urban and rural areas in Malaysia between the years 2000 and 2010. In general, all occupational groups experienced growth between the two years except for three groups – skilled agricultural and fishery workers; plant and machine operators and assemblers; and elementary occupations.

Table 2.7: Percentage distribution of employed population by occupation and stratum, Malaysia, 2000 and 2010

	2000			2010		
Occupation	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Legislators, senior officials & managers	6.9	8.7	3.3	7.5	9.5	3.3
Professionals	5.7	7.3	2.6	6.4	7.8	3.2
Technicians & associate professionals	12.0	13.9	8.3	14.8	16.8	10.4
Clerical workers	9.7	12.3	4.5	10.2	12.4	5.5
Service workers & shop & market sales workers	13.1	15.4	8.4	16.8	18.6	13.2
Skilled agricultural & fishery workers	14.2	2.5	37.8	11.3	2.0	31.2
Craft and related trades workers	9.2	10.0	7.6	10.5	10.5	10.5
Plant & machine operators & assemblers	16.0	16.2	15.8	11.8	11.8	11.8
Elementary occupations	13.0	13.7	11.7	10.7	10.6	10.9
Non-farm employment (%)	85.8	97.5	62.2	88.7	98.0	68.8
Total employed persons (000')	7837.3	5226.3	2611	11129.4	7571.6	3557.8

Source: Computed from Labor Force Survey Report, Department of Statistic, Malaysia (various years).

As expected the proportion of workers in agricultural occupations, as shown by the percentage of employed population in the skilled agricultural and fishery workers category, was much higher in rural areas (37.8 percent in 2000 and 31.2 percent in 2010). In contrast, the proportion in the non-agricultural occupation was significantly

higher in the urban sector. The next important occupational group in rural areas is the plant and machine operators and assembler with 15.8 percent in 2000. However, the distribution of employed persons in this occupation has decreased to 11.8 percent in 2010. The urban areas offer a wider choice of occupations, hence the occupational structure of workers in urban areas are more varied. In 2000, the plant and machine operators and assemblers group recorded the highest proportion (16.2 percent) while the second highest is for service workers and shop and market sales workers with 15.4 percent. However, in 2010, this occupational group has the highest proportion of employed persons (18.6 percent) followed by technicians and associate professionals (16.8 percent).

In terms of the RNF occupational groups, in general, there is an increase in the proportion of labor in each of the groups except for the plant and machine operators and assemblers. The RNF occupational group that has the highest proportion of employed persons is the service workers and shop and market sales workers group with 13.2 percent.

Table 2.8 shows that for both economically active men and women in rural areas the main group of occupation is the skilled agricultural and fishery worker group, with 34 percent of men and 25 percent of women. However, as a proportion of the economically active population, women are more likely to be active in the non-farm labor market compared to men in both urban and rural areas. In rural areas, about 75 percent of the economically active women are employed in the non-farm sector compared to only 66 percent of men. The non-farm occupational group in which women in rural areas are heavily employed is the service and sales workers group, followed by technicians and associate professionals, as well as clerical worker groups while in urban areas they are mostly employed in the clerical workers, service and sales workers as well as technicians and associate professionals group. In terms of male workers, those in

the rural areas are engaged mostly in the plant and machine operators and assemblers group and for those in the urban areas, they are mostly in the service and sales worker group.

Table 2.8: Percentage distribution of employed population by occupation, stratum, and gender, Malaysia, 2010

	Urban		Rural	
Occupation	**Male**	**Female**	**Male**	**Female**
Legislators, senior officials & managers	11.4	6.3	3.8	2.4
Professionals	6.7	9.7	2.3	5.1
Technicians & associate professionals	16.6	17.3	8.9	13.4
Clerical workers	5.9	23.0	2.7	11.5
Service workers & shop & market sales workers	17.4	20.5	10.3	19.2
Skilled agricultural & fishery workers	2.7	0.8	34.2	24.8
Craft and related trades workers	14.8	3.4	12.8	5.8
Plant & machine operators & assemblers	14.0	8.2	13.4	8.6
Elementary occupations	10.5	10.9	11.7	9.3
Non-farm employment (%)	**97.3**	**99.2**	**65.8**	**75.2**
Total employed persons (000')	**4700**	**2871.5**	**2412**	**1145.7**

Source: Computed from Labor Force Survey Report, Department of Statistic, Malaysia (various years).

2.6 Summary

The differences in the types of RNF activities and stages of development of the RNF sector reflects the fact that policy-makers are confronted with the development of different strategies rather than a one-size fits all type of strategy. The types of policy intervention to be used depend on the different stages of development. It is commonly observed that diversification of activities among rural households does not necessarily mean complete abandonment of farming activities. This is because most rural households still maintain on-farm activities despite their participation in other off-farm activities.

The preceding analyses have demonstrated that the agricultural sector is no longer the dominant sector in rural areas. Furthermore, rural employment can no longer

be explained in terms of agricultural production, more specifically in terms of the expansion or reduction of agricultural production or areas. The vulnerability to risks in agricultural production and land limitations are part of the reason for the reduction on rural household dependence on the agricultural sector as a means of enhancing their livelihoods. This has resulted in a diverse portfolio of activities which can contribute to the sustainability in rural livelihoods as it will improve the long-run resilience of rural households in the event of sudden shocks.

CHAPTER 3

REVIEW OF LITERATURE

3.1 Introduction

There are two general aims of this research. First, is to determine the livelihood strategies of rural communities. Second, is to examine the distributional consequences of household participation in non-farm activities. Therefore, the goal of this chapter is to guide the development of the study framework. This is to be achieved by discussing the determinants of livelihood diversification and identifying factors that are responsible for household selection of livelihood strategies, drawing mainly from the sustainable livelihood framework and the field of economic equity.

The chapter starts with a discussion on the concept of livelihood strategies, followed by a discussion on the correlates of diversification, and relevant approaches, and models, to the study of livelihood and agricultural households. Other sections of the chapter include discussions on the determinants of non-farm employment and the effects of these activities on income inequality among households. In the course of reviewing the literature a series of research hypotheses is proposed. This chapter will close with a summary of the review.

3.2 The concept of livelihood strategies

There have been several interpretations of what constitutes a livelihood. A livelihood is described by Chambers (1995) as a means of earning a living through the combination of skills, tangible and intangible assets. Ellis (2000), (as quoted in Winters, Corral, & Gordillo, 2001) considers a livelihood as consisting of assets, activities and access to these assets and activities that together determine the living chosen by an individual or a household. Livelihoods have also been viewed as a production function as livelihoods are processes that link assets to outcomes; hence livelihoods are not

comparable because they are processes (Barrett & Reardon, 2000). According to this view a livelihood strategy is a process of asset allocation or asset investment by households into a range of productive agricultural and non-agricultural activities, which enhances diversification out of agriculture (Corral & Reardon, 2001; Winters, et al., 2001). Households' asset allocation and investment decisions will result in the improvements of their livelihoods. Consequently, resulting in food security through better land management practices and sustainable income generation which would reduce the level of poverty (Brown, Stephens, Ouma, Murithi, & Barrett, 2006; Iiyama, et al., 2008; Jansen, Pender, Damon, Wielemaker, & Schipper, 2006; Stifel, 2010). Other than assets, there are also the elements of cultural and social choices that may influence livelihood choices (Ellis, 1998). These elements provide the dynamic and multidimensional nature to livelihood strategies.

3.3 Motives of income diversification

A rural household's decision to participate in non-farm activities depends on its incentive and capability. Some households diversify because they have less choice while some may diversify due to the availability of choices (Barret, et al., 2005). This suggests that diversification is done voluntarily or involuntarily. Poor households are less capable of overcoming negative shocks and are more risk averse. In an effort to earn additional income as well as to undertake activities with returns that may have low or negative correlation with returns from farming, poor households may have stronger incentives to participate in non-farm activities. Conversely, richer households may have better capacity to participate in non-farm activities due to their greater endowments in physical and human capital (Reardon, et al., 1998). According to Zhu and Luo (2006), households in China, for example, have strong incentives to diversify their income sources. However, with the underdeveloped credit and insurance markets in rural areas, these households tend to participate in non-farm activities that are labor-intensive and

have low entry barriers. These underdeveloped markets have not enabled these households to overcome their limited capacity and liquidity constraints.

Earnings from non-farm activities can significantly increase total household income and it may serve as a safety net through the diversification of income sources. Household participation in non-farm activities enhances its capability to overcome negative shocks and investing in farm activity. It reduces income fluctuations and enables the adoption of more profitable agricultural technologies hence encouraging the transformation of the agricultural sector (Zhu & Luo, 2006). Income diversification among agricultural households is achieved by diversifying their land and financial assets. However, there is a lack or absence of a well-functioning land and financial markets in most developing countries. Therefore, diversification using these assets is not feasible. As a consequence, many rural households have resorted to choosing a second best livelihood strategy which involves the allocation of household labor instead (Bhaumik, Dimova, & Nugent, 2006).

In general, studies on household diversification into off-farm activities which include agricultural-wage employment and non-farm employment have concluded that income diversification is mainly for the purpose of supplementing and diversifying household income, increasing their welfare and reducing the risks related to agricultural production. As an example, a study by Giles (2006) in rural China has shown that off-farm activities have been used as a way of smoothing shocks in agricultural production. Participation of households in off-farm activities may be more important for farm households with credit or liquidity constraints. This is because participation in off-farm activities would enable farm households to invest in inputs that will increase their farms' productivity (Berdegué, et al., 2001) by purchasing or renting equipment, financing initial investments and investing in skill through training (De Brauw, et al., 2002).

In addition to the above motives, there are also other motives for diversification depending on country specific context. In a review by Ellis (1998) of income strategies and livelihood diversification, the following motivations for diversification have been highlighted: seasonality, differentiated labor markets, risk management strategies, coping behavior, imperfect credit markets, and inter-temporal savings and investment strategies. In addition, Barrett and Reardon (2000) suggested that diversification can be due to desperation or opportunity.

The livelihood strategies of rural households are affected by seasonality as it results in variations to labor returns in farm and non-farm activities. This will also have implications on occupational changes when households reallocate their labor hours among different types of jobs with differing returns, as noted by Barrett and Reardon (2000) of smallholder farmers in the semi-arid tropics of Africa. In these areas, households tend to allocate all of their labor to farming during the wet season when farm labor returns are high. During the dry season, on the other hand, these labors will be reallocated to non-farm activities. This type of labor allocation decision holds true in areas with seasonal labor markets. Another implication of seasonality is the mismatch between continuous consumption and uneven income flows. However, this may not be a problem if crop storage, crop sales and savings are available as these can be used to stabilize income and hence consumption. Stabilizing income is an income diversification motive that is closely related to seasonality because of the existence of income instability together with the need to smooth consumption (Alderman & Paxson, 1992). In stabilizing income, households participate in activities with seasonal cycles that are different from those of farming. Examples of such efforts are reflected in seasonal migration into other agricultural zones and circular or permanent migration with one or more household members participating in non-farm activities (Barrett & Reardon, 2000).

As with any other economic resources, household assets are also subject to diminishing returns as more assets, especially land and labor, are invested in one economic activity, hence the reallocation of resources to other economic activities (Barrett, Bezuneh, & Aboud, 2001). A household will continue allocating assets to various activities until the marginal returns are equalized. But households with lesser endowments will not be able to achieve the exact ratio of marginal returns, given the existence of imperfect markets. Therefore, these households tend to have a highly diversified portfolio, which consist of low return activities. This also implies that they are "pushed" into a desperation-led diversification (Barrett & Reardon, 2000).

In areas where labor markets are not affected by seasonal variations, diversification decisions are affected by risk (Bryceson, 1996; Ellis, 1998; Rose, 2001). Risk may have a role in diversification but it is not a necessary condition for a household's decision to diversify. In terms of risk management, diversification is undertaken as ex-ante mitigation through portfolio choice or ex-post coping through adaptation to shock. Risk causes households to be vulnerable to income variability, especially if they are dependent on agricultural income as their main source of income.

The ability of households to smooth consumption and to ensure against adverse outcomes is also affected by risk when there is an absence or underdeveloped markets. As an example, missing land markets may not allow households to rent out or sell their land, hence are forced to cultivate land that would only provide them with low returns. Therefore, they are not able to allocate all of their time to more specialized activities in which they may have greater comparative advantage. With labor market imperfection and missing labor markets, households will not be able to hire labor to work on their land, hence the household's optimal use of its labor time also include time on less productive farming or they may not get any return from their land. Consequently, missing or incomplete markets is another reason for diversification. In addition to

encouraging diversification, missing markets can also discourage diversification (Barrett & Reardon, 2000).

Missing credit markets, for example, may be a form of barrier into high-return activities which require highly expensive physical assets. The presence of a weak land and financial markets is also an indication that within the context of a household's livelihood strategy, the labor supply decisions are made based on the comparison between productivity and risk factors. Nonetheless, households do not have access to all employment opportunities. Although credit markets may be complete, many farmers may have a deep attachment to agriculture as a way of life and hence are willing to forgo profits in order to maintain the family farm (Barrett & Reardon, 2000).

Diversification has been found to be positively correlated with greater ability to cope with shocks. This indicates that diversification reduces the vulnerabilities of a chosen livelihood (De Janvry, Fafchamps, & Sadoulet, 1991). In view of the adverse effects of risk on its welfare a farm household may not be able to be dependent solely on farm profits, causing them to have a portfolio of income generating activities instead. As a consequence, the household's diversification decision is a form of ex-post coping behavior that is related to its own farm production (Alderman & Paxson, 1992; Rose, 2001). The ex-post coping strategy occurs when farm households reallocate their labor to non-farm income generating activities after they have experienced a negative agricultural shock, such as adverse weather conditions. This implies a trade-off between the level of incomes and risk of income failures. Households are mostly risk averse, hence are more willing to accept lower income with lower risk of income failure that would provide them with greater security or low covariate risk (Ellis, 2000). Kochar (1999) in his study on the effects of idiosyncratic (farm specific) crop income shocks on farm households in India observed an ex-post response from farm households. In another Indian study, Kochar (1995) argued that the main strategy used by rural

households in coping with negative idiosyncratic shocks is by adjusting their labor supply rather than asset or other strategies.

Lay, Narloch and Mahmoud (2009) went further to link ex-ante risk management and ex-post coping strategies with high and low-return activities. The study on the effects of different livelihood strategies on poverty and income distribution in Western Kenya, suggested that household participation in high-return non-agricultural activities is a form of ex-ante risk management strategy because labor allocation into this type of activities is done before the occurrence of a negative shock. The ex-ante decision is based on the need to find alternative sources of income in a risky environment (Barrett & Reardon, 2000; Rose, 2001). It was also noted that risk affects a household's selection of non-farm activities. In situations where high-return activities are riskier than lower return activities, households who are able to overcome entry barriers may choose to participate in both types of activities based on their risk preferences.

The possibility of income reduction from risk spreading depends on the covariate risk between components of a household's portfolio of income generating activities. A household will not experience a decrease in income if there are low covariate risks between income components. However, a common characteristic of rural livelihoods in developing countries is the tendency to have highly correlated risks among income sources. This is because the income earning opportunities available to poor households are mostly in their own farm production and agricultural-wage labor. This would mean that if a locality is experiencing unfavorable weather conditions such as drought or flood, all income streams will be affected. Another option available to poor households is to engage in on-farm diversification by planting a mix of crops to take advantage of the differences in risk-proneness of crops. However, this only offers partial protection to households. Within this uncertain environment, diversification is

pursued with the intention of reducing the covariate risk between different activities to smooth consumption (Bryceson, 1996; Dercon, 2002). Consequently, the diversification into non-farm activities is an important way of dealing with risk as this type of diversification would result in low risk correlations between various income sources. The importance of diversification into non-farm activities was also noted by Lay et al. (2008) as a means of risk management and will also enable the smoothing of income and consumption in rural areas. This is because of the greater uncertainty of agricultural-based livelihoods.

The existence of economies of scope is also another reason for diversification. An economy of scope occurs when the same inputs are able to produce greater per unit profits when spread across multiple outputs. This concept is different from economies of scale where per unit profits are increasing as the amount of production inputs increases. Economies of scale tend to lead to specialization while economies of scope are more relevant to diversification. Barrett and Reardon (2000) in their study of income diversification in Africa observed that there is no empirical evidence of economies of scale among large farms in Africa. This is mainly due to the absence of irrigation and mechanization, which have resulted in little pressure to specialize in a single crop. However, with greater promotion for crop rotation, integrated crop-livestock systems, as well as non-farm activities, there is a great potential for economies of scope.

Another way of categorizing the income diversification motives is by grouping them into "push" and "pull" factors (Ellis, 1998; Shi, Heerink & Qu, 2007). Factors such as land scarcity, declining agricultural productivity, missing or incomplete input and output markets, diminishing marginal returns, climatic uncertainty and variability of farm-gate prices are known as "push" factors (Escobal, 2001; Stifel, 2010; Zhao, 2005). These factors are considered as constraints that forced households to find ways to use rural non-farm employment as a way of smoothing inter-year and intra-year variation in

incomes and consumption, to increase income and alleviate poverty, to manage risk and cope with income shocks, and to finance investments in farm, human and other assets (Ellis, 1998; Reardon, et al., 2001; Rozelle, Taylor & De Brauw, 1999; Taylor, Rozelle & De Brauw, 2003). This group of factors may also influence individual decisions to undertake second jobs, especially those who are involved in farming and in non-farm self-employment. Although earnings from second jobs in the non-farm wage sector may be lower than those from their first job in agriculture, the non-farm job remains attractive relative to all other earnings whether they are for first or second jobs. Barrett et al. (2005) have supported the idea that the heterogeneous constraints faced by households will characterize their choice of activities. Furthermore, Bryceson (2002) observed that situations of desperation may lead to deagrarianization or the shifting of livelihoods away from farming to non-farm activities.

The "pull" factors, on the other hand, refer to factors that are related to attractive and more profitable opportunities of employment in the non-farm sector, in particular, the large difference in income between rural and urban areas (Stifel, 2010; Zhao, 2005). The pull factors can also be due to the strategic complementarities between activities, such as the integration of crop and livestock, skills or technological advancement that enables specialization based on comparative advantages. Other pull factors include reduction of barriers to participation in profitable activities, infrastructure development that improves access to local engines of growth such as commercial agriculture, or proximity to urban areas which creates opportunities for income diversification (Barrett, et al., 2001).

A household's diversification decisions are determined by a combination of push and pull factors (Ho, 1986). As an example, market development encourages households to reallocate their productive resources to higher-return activities (Xia & Simmons, 2004), while poor resource endowment, seasonality of agricultural output,

frequent climatic hazards, and poor access to credit may push rural households to undertake a wider range of activities in order to secure their livelihood. According to Ho (1986), the relative importance of these factors partly depends on the stage of economic development and the intensity of the population pressure on land use. Push factors will be more significant in determining participation in rural non-farm activities for households located in a region with low level of economic development or poor agricultural areas. Consequently, for these households, the non-farm activities are considered as activities of "refuge" in which households have access to a source of immediate and relatively secure income even if the activities are low in return and productivity (Elbers & Lanjouw, 2001; Velazco, 2009). However, involvement in "refuge" employment does not contribute to the alleviation of poverty (Elbers & Lanjouw, 2001) and the sustainable development of rural communities and regions (Berdegué, et al., 2001).

In discussing "push" and "pull" factors, Zhu and Luo (2006) have suggested that if the non-farm sector has high returns then the "pull" factors will be dominant. In contrast, if farm activities are not able to provide sufficient income for households due to inadequate farm output due to drought, floods, or insufficient land, thus the "push" factors may dominate. Furthermore, Dercon and Krishnan (1996) have noted that a household's ability to participate in a particular activity will differentiate the better-off households from those who are merely getting by. In summary, a household's income diversification strategy is affected by the constraints and opportunities that may exist for many activities.

3.4 Diversification strategies

In general, the decisions households make with respect to the choices of non-farm employment is influenced by various diversification motives as well as the pull

and push factors discussed previously. Rural households are faced with various constraints and heterogeneity of non-farm employment opportunities. This has resulted in wide variations of livelihood diversification strategies (Barrett, et al., 2005). However, some broad classification of livelihood strategies can be made.

Diversification strategies have been shown to be different between the poor and non-poor households (Brown, et al., 2006; Elbers & Lanjouw, 2001; Iiyama, et al., 2008; Reardon, et al., 2000; Stifel, 2010). In general, the diversification strategies of rural households can be classified as survival-led and opportunity-led strategies (Davis & Bazemer, 2003; Lay, et al., 2008; Lay, et al., 2009).

The survival-led strategy is also known as distress-push diversification (Barrett, et al., 2001; Islam, 1997) or defensive, survival, or coping strategy (Ahmed, 2006). This type of diversification is undertaken in situations of desperation such as poverty, insufficient asset, vulnerability, and disaster (Ellis, 1998; Haggblade, et al., 2005). It is observed especially among poor rural households as well as in areas with low agricultural potential (Matsumoto, Kijima, & Yamano, 2006). These households usually adopt multiple livelihoods, involving a portfolio of low-return non-farm activities which are less productive than agricultural activities. These activities serve as a safety-net that prevents the poor from falling into greater hardships and escaping further declines in income (Ahmed, 2006; Lanjouw, 2001). They are forced or pushed into diversification mainly due to their insufficient or weak non-labor asset endowments that could not allow them to sustain their subsistence by depending solely on agricultural production (Haggblade, et al., 2005; Reardon & Taylor, 1996). The returns from these activities may be lower from what they could earn from agriculture. Consequently, participation in low-return activities is a form of coping mechanism that enables poor households to reduce the hardships due to poverty rather than as a route out of poverty (Ferreira & Lanjouw, 2001).

The poorest households have been found to have the tendency to rely solely on family farming and agricultural-wage employment. Stifel (2010), for example, observed that for households in Madagascar the poverty rate is higher among households that combine farming and agricultural-wage employment. This is especially true for households in the bottom end of the income distribution. This indicates that households may resort to agricultural-wage employment activities as an ex-post reaction to a low farm income and various push factors.

In contrast, the non-poor households with greater asset endowments will choose to diversify their livelihoods with the objective of maximizing the returns on their assets leading to an opportunity-led strategy. This type of diversification is due to choice and opportunities which involves proactive household strategies to improve their standard of living (Ellis, 1998). It is common among non-poor rural households, who have greater asset endowments, thus having the option to diversify into high-return activities. It is also observed in areas with good agricultural potential through greater inter-sectoral linkages (Haggblade, Hazell, & Brown, 1989) and the availability of non-farm employment opportunities is often linked to market access (De Janvry, et al. 1991). The chosen activities will have at least the same returns as agricultural activities and this will reflect the existence of entry barriers for the poor.

The opportunity-led strategy is also known as demand-pull diversification as it is due to pull factors such as new employment opportunities in the non-farm sector as a result of advancement in technology, greater linkages with markets outside of the local economy and proximity to urban areas (Haggblade, Hazell, & Reardon, 2002; Lay, et al., 2008). This type of diversification is identified as part of a growth strategy for an economy and it is a response to evolving markets and technological innovations which provide opportunities for increasing labor productivity and household income (Ahmed, 2006). This was also observed by Woldenhanna and Oskam (2001) for Northern

Ethiopia where the existence of entry barriers in the non-farm labor market have resulted in wealthy farm households being able to dominate the lucrative non-farm activities. Low farm income and the availability of surplus family labor were the two main reasons for farm households' diversification into non-farm wage employment, while the attraction of higher returns have motivated them to participate in non-farm self-employment.

While the two typologies are utilized as a way of differentiating the motives and opportunities of diversification, they may fail to consider the complexity of local circumstances. As an example, Lay et al. (2009) found that poor households may not necessarily dominate the survival-led or desperation-led diversification. The researchers found that rural households are not increasingly diversifying their income portfolios in Burkina Faso. The availability of better opportunities in agriculture, particularly in the cotton and livestock sectors has allowed households to specialize in these activities. Within this context, non-farm activities become more opportunity-led.

Households that are able to choose an opportunity-led strategy have been known to achieve higher agricultural productivity as these earnings provide farmers with the source of cash for investment into productive assets (De Janvry, et al., 2005; Ellis & Freeman, 2004; Hertz, 2009; Oseni & Winters, 2009; Stampini & Davis, 2009; Takahashi & Otsuka, 2009). This would result not only in the improvement in production technologies, which would further increase agricultural yields, but also improvement in their welfare by enhancing their ability to adopt livelihood strategies consisting of high-return activities instead. In other words, participation in non-farm activities would provide households with the opportunities to increase the quantity and quality of their assets, hence enabling further investment into non-agricultural activities. However, the effect of non-farm income on agricultural productivity and household stock of assets would depend on the type of non-farm activity pursued by the

households. If they were to participate in low-return activities, which imply a survival-led strategy, then it may not result in the generation of income that would be sufficient for continuous income generation. In this situation, the non-farm income is mainly used for household consumption (Abdul Malek & Usami, 2010; Lay, et al., 2008).

In studying the effect of income diversification and household welfare in Zimbabwe, Ersado (2003) found that the income of richer households are more diversified in rural areas compared to urban areas. It was also discovered that households living in rural areas with highly variable rainfall were more likely to have a large number of income sources, which is consistent with the idea of income diversity as a risk management strategy.

Households belonging to livelihood clusters that are highly dependent on agricultural income as their main source of income have been found to have a significantly lower income than those that earn a combination of income from agriculture and non-agricultural activities (Ansoms & McKay, 2010; Babulo, et al., 2008; Brown, et al., 2006; Iiyama, et al., 2008; Stifel, 2010). Consequently, livelihood strategies that are dominated by high-return non-agricultural activities such as self-employment in rural enterprises, skilled off-farm employment, and non-farm wage employment are considered as superior.

Based on previous studies on the effect of diversification factors on the selection of livelihood strategies among rural households this study seeks to determine the effect of non-farm employment on the resulting income from a diversified livelihood strategy. In order to evaluate this relationship the following hypothesis is proposed:

H_1: *Livelihood strategies that combine farming with non-farm activities will result in significantly higher percapita income.*

3.5 Non-farm activities and poverty

There is a subtle relationship between the rural non-agricultural sector and poverty (Ferreira & Lanjouw, 2001). The existence of low and high return income generating activities; with different barriers to entry have resulted in an uncertain relationship between RNF income and poverty. A review by Reardon et al. (1998) found a higher share of non-farm income among poorer households in rural Pakistan and Kenya while a higher share among richer households in Niger, Rwanda, Mozambique and Vietnam. Studies by Elbers and Lanjouw (2001) for Ecuador, Adams (2001) for Jordan and Isgut (2004) for Honduras have also found that the poor have a higher share of income from non-farm employment than the non-poor. In contrast, Adams (2002) found the opposite for rural Egypt.

The impact of non-farm income on poverty is observed when the non-farm sector is able to offer the poor with employment opportunities that provides them with wages that are sufficiently high to move them out of poverty. As an example, De Janvry et al. (2005) found that non-farm income has decreased the severity of poverty in China as it provides rural households with an alternative to small landholdings. The positive effect of non-farm income on poverty reduction is also observed by Abdul Malek and Usami (2010) for developed agricultural areas of Bangladesh. This is because the non-farm labor income is used for consumption rather than being invested in agricultural inputs or non-farm self-employment activities.

Given the heterogeneous nature of non-farm activities, studies on the effect of non-farm income on poverty have often grouped non-farm activities by labor productivity and income level such as high labor productivity/high income activities and low labor productivity/low income activities (Lanjouw & Lanjouw, 2001). In low productivity/low return activities, which are accessible by the rural poor and the

landless with modest assets and skills, the benefit will generally go directly to the poor. This will result in lower poverty and have an equalizing effect on the distribution of rural income (Ahmed, 2006). These income activities have also been categorized as a "residual source of employment" or a "last-resort" income source, which has been found to be common among poor households, especially among women. These "last-resort" non-farm incomes may be very low, hence they do not provide much prospects for poor households to move themselves out of poverty and reducing the severity of deprivation (Lanjouw, 2001).

In a study by Stifel (2010) on the effect of households' livelihood strategies on household welfare in Madagascar it was observed that during periods of low demand for agricultural labor, individuals are more involved in non-farm employment for their second jobs. Therefore, a positive relationship between rural non-farm employment and welfare as measured by percapita household expenditure was observed. Households who combine farming and non-farm employment especially in non-wage family enterprises and also those who depend solely on non-farm activities, in particular wage employment have much lower poverty rates. This is in contrast to those who combine farming and agricultural-wage employment as well as those who depend solely on farming. The positive relationship is similar to the findings from other African studies (Barrett, et al., 2001).

Stifel (2010) also observed that workers in higher expenditure quintiles tend to be more involved in non-farm employment compared to those in the lower expenditure quintiles. Nearly 25 percent of workers in the richest quintile have non-farm employment as their primary employment compared to only 5 percent for those in the poorest quintile. Despite greater involvement in non-farm employment, a significant portion (69 percent) of the workers in the richest quintile still has farm employment as their main source of income. This indicates that non-farm employment is not the only

path out of poverty as shown by the low involvement (11 percent) of workers in the poorest quintile in non-farm activities. For these workers non-farm employment serves more as a safety net. Nonetheless, the study noted that employment strategies that include non-farm employment will generally be the dominant strategy among richer households compared to those that rely solely on farming.

A household's asset endowments are important to its choice of a livelihood diversification strategy (Reardon & Vosti, 1995). Households within a small area would probably be relatively homogenous in terms of certain assets such as natural (rainfall, temperature, vegetation) and public (infrastructure, markets) capital assets. However, they may be highly heterogeneous in terms of human (labor, skill, knowledge) and physical (land, livestock) asset endowments (Iiyama, et al., 2008). This was observed by Ellis and Freeman (2004) and Ilyama et al. (2008), who found that poorer households with a lack of education and specialized skills, in addition to significant barriers to entry into limited high-return opportunities, have been forced to choose lesser diversified income portfolios. This type of livelihood strategy would involve a combination of low-return farm and non-farm activities, with more variable earnings. Despite the fact that participation in low-income activities would provide them with some form of safety net, the combinations of low-return activities and little diversification implies that households will remain trapped in poverty (Iiyama, et al., 2008).

Roslan and Siti Hadijah. (2011) in a study on the effects of farmers' participation in non-farm activities on the time taken to exit poverty among 384 agricultural households in Kedah, found that participation in non-farm activities would reduce the time taken to exit poverty. Rural households that are located in a major industrial area have the lowest poverty incidence among them. The availability of non-farm employment opportunities and higher wages in this area are among the possible reasons for the low poverty incidence. A comparison between households earning farm

income only and those who have earnings from a combination of farm income and non-farm income revealed that income growth will reduce the time taken to exit poverty for households in the later group. The time required for poor farmers who also earn non-farm income will be shorter (8.57 years) compared to those who are dependent only on farm income (10.74 years) with an income growth of 6.5 percent.

In another Malaysian study on the effect of non-farm activities on poverty, Ishida and Azizan (1998) in their analyses of rice farmers in Sawah Sempadan and Sungai Burong in the Northwest Selangor Integrated Agricultural Development Area (IADA) concluded that despite the technological advancement in rice production, poor farmers have remained poor. This has been due to their small farm sizes, old age, and low educational level. Large farms have been the main beneficiaries of government subsidies and small farmers are unable to increase the size of their cultivated area due to financial constraints. Old age and low educational level have not enabled them to participate in non-farm employment. Therefore, livelihood strategies of these farmers include lower return agricultural-wage employment, which is a common employment among poor farmers.

3.6 Non-farm income and income distribution

With the growing importance of non-farm earnings among rural households in developing countries, another important issue related to the rural non-farm economy is the effect of non-farm income on overall rural income inequality (Escobal, 2001; Reardon, et al., 2000). Does non-farm income have any effect on inequality and if it does, will it reduce or worsen inequality? In other words, does the concentration of higher-paying non-farm employment among the non-poor rural households worsen income inequality? If poor households have access to most of the non-farm activities, will this lower inequality? These questions will have important policy implications,

especially in the formulation and implementation of interventions that are intended to improve the poor's access to existing non-farm activities or to improve the profitability of their activities.

The relationship between farm income and non-farm income has been found to be important in determining the effect of non-farm employment on overall income inequality (Reardon, et al., 2000). Farm and non-farm incomes have been found to have a negative covariance, which means that these two types of income are offsetting each other. Smaller farms would have higher shares of non-farm income compared to larger farms; hence non-farm income has an equalizing effect on income distribution. Studies have commonly found a U-shaped relationship between the share of non-farm income and total income or farm size. The share of non-farm income is relatively high for small farms and the poorest households, declines for the middle income and/or landholding range and then increases at higher income and farm size. In general, Reardon et al. (2000) observed a positive relationship between non-farm income shares and total household income and/or landholding in Africa, a negative relationship in much of Latin America and very mixed results for Asia.

Another contributor to the U-shaped relationship between the share of non-farm income and household income is the existence of high and low return non-farm activities with non-poor households being highly involved in the former (Evans & Ngau, 1991; Lanjouw & Feder, 2001; Reardon, Delgado, & Matlon, 1992). This has resulted in the ambiguous distributional effect of non-farm incomes. The survival-led diversification strategy should decrease inequality by increasing the incomes of the poorer households. The opportunity-led diversification, however, should increase inequality as it may be confined to the non-poor households (Lay, et al., 2008).

Despite the positive relationship between the non-farm income share and total income, Reardon et al. (2000) cautioned that this may not be true for non-farm income levels. The existence of entry barriers into high return activities causes a wage gap among different income strata. Therefore, poor households with low asset endowments will be employed in low-paying non-farm jobs, especially those involving intensive use of unskilled labor, which would provide only a low non-farm income level.

In spite of the growing research on non-farm activities not much is known about the implications of the chosen portfolio of activities or income diversification strategies on the pattern of income distribution. This is because although non-farm income increases total income, this income does not necessarily improve income distribution as it is more unequally distributed than farm income (Barham & Boucher, 1998; Elbers & Lanjouw, 2001; Ellis, 2000; Escobal, 2001; Haggblade, et al., 2005; Lanjouw & Lanjouw, 1995; Leones & Feldman, 1998; Reardon, et al., 2000). However, other studies have suggested that non-farm income can reduce inequality if there is greater participation of poor households in higher return non-farm activities than richer households (Adams, 2002; De Janvry & Sadoulet, 2001; Janaiah, Bose, & Agarwal, 2000).

According to Reardon et al. (2000) the inequality reducing effect of non-farm employment depends on three empirical assumptions: (i) the non-farm income is large enough to affect the rural income distribution; (ii) the non-farm income itself is unequally distributed; and (iii) the unequally distributed non-farm income benefits mostly the poor. The mixed effect of non-farm income on inequality implies that assumptions (ii) and (iii) may not always hold. Nevertheless, these do not imply that non-farm employment sources would necessarily reduce rural income inequality. This is due to the differences in individual asset holdings as well as access to public goods and services which influence a household's motive for diversification, the distribution of

these assets, the existence of entry barriers and the availability of non-farm employment opportunities (Lay, et al., 2009; Nega, Marysse, Tollensc, & Mathijsc, 2007).

As a result of the differences in the quality and quantity of their asset endowments households may not have the same access to high-return activities (Barrett, et al., 2001; Dercon & Krishnan, 1996). In land-rich and labor-poor areas, such as Africa, agricultural income has been found to decrease inequality because most households are forced to stay in agriculture. On the contrary, RNF income is an inequality increasing source of income as only the non-poor are pulled into the non-farm sector. In land-poor and labor-rich countries such as parts of Latin America and Asia, agricultural income has been found to increase inequality while RNF income decreases inequality (Adams, 2001). The lack of financial and human capital assets for example, may constrain the poorer, more illiquid, uneducated or unskilled households from entering high-return activities. This will limit the choice of feasible income-generating activities from which they can choose from, hence compelling them to diversify into low return activities with higher variability in earnings. This would result in a worsening of income inequality in rural areas (Lanjouw & Feder, 2001; Nega, et al., 2007; Reardon, 1997; Reardon, et al., 2000; Stifel, 2010; Woldenhanna, 2002).

In terms of the effect of income distribution among different income groups, agricultural-wage and non-farm incomes have been found to be more equally distributed compared to farm income among high-income households in the Philippines. This means that farm income contributed less to overall inequality (Leones & Feldman, 1998). Studies by Reardon et al. (1992) on Burkina Faso and by Elbers and Lanjouw (2001) on Ecuador also revealed that higher non-agricultural incomes result in higher income inequality. Lay et al. (2008) discovered that engagement in high-return activities does increase inequality due to the concentration of these activities among the richer rural households. Stifel (2010) in his study of livelihood strategies in Madagascar

revealed a strong positive relationship between non-farm income shares and welfare. Households in the richest quintile derive more than twice the income share from non-farm employment compared to those in the poorest quintile. It was also suggested that the concentration of non-farm income among the richer household would lead to higher income inequality.

Escobal (2001), following Shorrocks (1983), in decomposing the Gini coefficient for total rural income into its factor components, found that wage employment income account for 45 percent of income inequality. This type of income was found to be relatively unequally distributed, favoring the rich rather than the poor households as they are mostly employed as low-wage farm labor. This would imply that non-farm wage increases income inequality. Nevertheless, this does not mean that there exists any causality between non-farm wage income and overall income inequality. This was also noted by Reardon et al. (2000). The study concluded that if an individual income source is unequally distributed compared to overall income, it may not be contributing to overall income inequality. Having an additional source of income would actually decrease overall income inequality but because rural markets are fairly segmented, it may prevent the inequality reducing effect from occurring.

Canagarajah, Newman, and Bhattamishra (2001) have been more specific in their findings on the distributional effect of non-farm self-employment income among rural households in Ghana and Uganda. This category of non-farm income was found to have a greater inequality increasing effect compared to non-farm wage income. In contrast, De Janvry and Sadoulet (2001) in their study on rural Mexico found that non-agricultural self-employment and agricultural-wage employment reduce overall inequality. A decomposition of total income inequality was performed using the decomposition method by Pyatt, Chen, and Fei (1980). This involves the determination of relative concentration coefficients for different income sources. The decomposition

results show that agricultural income is the largest contributor to total inequality (60 percent), followed by non-agricultural wage income with a contribution of 23 percent. It was also revealed that agricultural-wages, remittances, and self-employment incomes are least correlated with total income. Agriculture and non-agricultural-wage income have been observed to cause an increase in total inequality, while agricultural-wage income, self-employment income, and remittances tend to reduce income inequality. This indicates that not all off-farm income sources reduce total inequality. The study concluded that off-farm sources of income resulted in a reduction of total inequality that is associated with agriculture. Other studies have also observed an inequality decreasing effect of non-farm income such as studies by Zhu and Luo (2006) for China; Adams (2001) for rural Egypt, Leones and Feldman (1998) for the Philippines as well as Arayama et al. (2006) for farm households in Korea.

Janaiah et al. (2000) observed an income inequality decreasing effect of non-farm income in their examination of the structure and inequality of household income in rice dominated villages in India. Through the use of pseudo Gini coefficient for each of the income sources, it was found that non-agricultural income sources have a lower contribution to total inequality. The contribution ranged from 13 percent to 30 percent with the highest contribution in the rain-fed ecosystem compared to the irrigated ecosystem. The households in the rain-fed area earn a higher non-agricultural income mainly from less productive activities. The importance of this type of activities was also stressed by Adams (2002) who had suggested that in improving income inequality, the most effective means is by giving more emphasis non-farm unskilled labor. This is because poor households lack access to land which is the key productive asset in rural areas. In the study by De Janvry et al. (2005) participation in non-farm activities has resulted in greater improvements in the income of the poorest households while the most efficient farmers have remained in agriculture. The Gini index was found to be

lower when there is a non-farm income component in the households' income. Without non-farm income, the Gini index was higher by 36.8 percent.

The analyses on the distributional effect of non-farm income in the studies discussed above have been based on data collected for one specific period. In a comparative study by Estudillo, Quisumbing, and Otsuka (2001) which examines the changes in rural household income sources in the Philippines found that non-farm income had changed from being an inequality decreasing income source to an inequality increasing income source. This is because non-farm income has become a major income source in rice producing villages in the Philippines. Similar observation was also noted by Lanjouw and Stern (1998) in a longitudinal study of Palanpur, India where the distributional effect of non-farm income has changed from equalizing to disequalizing (as quoted in Lanjouw and Feder, 2001).

Studies on the effect of non-farm income diversification on income distribution reveals that higher income households are more diversified in relatively skilled international migration and local high return non-farm activities compared to lower income households, which tend to be more diversified into relatively low-return non-farm activities. Among local non-farm activities, non-farm self-employment income is quite fairly distributed except among higher income households. With this finding in rural Bangladesh, Abdul Malek and Usami (2009) concluded that lower income households receive more income from low-return non-farm self-employments which virtually require no education and little or no capital. The incomes from non-farm wage employment and local remittance were found to be unequally distributed among the income groups. Education and skill requirement were listed as the probable reasons for such an occurrence. These two factors are also the main reasons for the ability of richer households to earn higher international remittances and local non-farm self-employment incomes.

It is generally observed that the decomposition of total income inequality by income source shows that agriculture is the largest contributor to income inequality, followed by non-agricultural-wage income. The most egalitarian source of income is agricultural-wage employment, which is an easy entry low-paying option, followed by self-employment, a highly dual economic activity that also includes much easy entry, low-return activities (De Janvry & Sadoulet, 2001). Non-agricultural-wage income is the most remunerative income.

Interestingly, although non-farm income in rural Egypt is more unequally distributed compared to other sources of income its contribution to overall income inequality is the smallest (23.9 percent). According to Adams (2002), this is probably because non-farm income has the smallest share in total rural income; a lower Gini correlation with total income rankings; and a low source Gini. There is also a low degree of correlation between non-farm income and total income. In view of the differences, it is therefore important to determine the factors that affect household access to non-agricultural employment in particular those which provide the most remunerative employment opportunities.

Liebbrandt, Woolard, and Woolard (2000), in their study involving rural homeland African communities have decomposed the Gini coefficient, using the decomposition method by Stark, Taylor, and Yitzhaki (1986) in determining the relative importance of major income components on overall income inequality. The study highlighted the importance of the correlation between the inequality of an income source and overall inequality, the inequality in the distribution of the income source and the share of the income source in total household income in determining the effect of an income source on total inequality. The decomposition analysis reveals that wage income is the most important income component and therefore, is the most important contributor to total inequality (83 percent). In contrast, agricultural income only

contributes about 4.4 percent to total inequality. Remittance income contributes up to 25.6 percent of total income but because it has a low correlation with total income, its contribution to the overall Gini coefficient is also low (14.5 percent).

Income distribution studies in major agricultural areas have also found ambiguous effects of non-farm income on overall inequality. Cheng (1996) found that income from grain sales to the state was the main contributor to the level of inequality in major grain producing areas. This is contrary to the belief that rural industrialization was the major source of inequality in rural China. The high agricultural commercialization rate indicates that crop income is the main source of income for farm households in the study area. The contribution of crop income to overall inequality was greater than its share in total household income hence crop income is an inequality increasing income source. Another reason for the greater contribution of crop income to overall inequality is its greater correlation with total income. On the contrary, non-crop income from non-farm activities such as construction and services was found to have a decreasing effect on overall inequality. This was shown by a negative value for the elasticity of inequality for these income sources. Although there are other non-cropping incomes with an elasticity of -0.026 for wages from rural enterprises, for example, this small value implies that the impact of policy changes will be minimal.

There is a possibility of a co-existence of high and low-return livelihood strategies especially if certain strategies are found to offer higher returns than others. This is because different asset allocations will yield different income distributions that can be ordered or ranked based on the resulting household welfare. This indicates that there are barriers to adopting high-return livelihood strategies (Stifel, 2010). A positive correlation between total household income and non-farm employment suggests that access to high-return livelihood strategies is limited to the group of households that are well-endowed with assets. Consequently, this may lead to greater inequality. On the

contrary, the sector also has a role as a safety-net that tend to sustain the same households and this will have an equalizing effect (Lanjouw, 2001).

Another approach to analyzing the distributional impact of non-farm income is by categorizing the non-farm activities into activities of high and low productivity (Elbers & Lanjouw, 2001; Lanjouw & Feder, 2001). Non-poor households are mostly involved in high-productivity activities. Therefore, the growth of these activities tend to increase the income inequality in rural areas. The poor households, however, do not benefit directly from such activities due to their lack of skills and other assets that are necessary for them to gain access to these activities. Conversely, low productivity non-farm activities may reduce rural inequality. Although the returns are low, these returns usually accrue to the poor. Furthermore, this will decrease poverty and keep it from rising. This implies that low-productivity non-farm activities also act as a safety net in rural areas. In general, Elbers and Lanjouw (2001) concluded that at the household level, inequality tend to increase with the increase in the share of local labor force in high-productivity non-farm activities. In contrast, employment in low productivity non-farm activities may have no relationship with income inequality.

Using the relative concentration coefficient (g), following the decomposition analysis by Adams (2001), Nega et al. (2007) found a value of $g > 1$ for non-farm income, which means this income source has caused an increase in income inequality. This finding was also supported by using the percentage change impact of income source on inequality where a 1 percent rise in non-farm income sources increases income inequality by 0.001 percent. Wage income is the main income source and is a major contributor to the non-farm income inequality with a percentage contribution of 48 percent followed by food for work contributing about 21 percent. However, the income from food for work is an inequality decreasing source of non-farm income. This is because the food for work program which is run by the government mostly involves

the poor, hence the inequality decreasing effect. Whereas, wage income, own business income, transfer and migration income are inequality increasing sources of income (Nega, et al., 2007).

3.7 Conceptual approaches relating assets to choice of activities

This section elaborates on the underlying conceptual and theoretical framework in studying household income diversification and livelihood strategies. The sustainable livelihood approach and the agricultural household model have often been used in income diversification studies as a basis for analysis. In order to increase the understanding of rural household resource allocation decision, the agricultural household model (AHM) is utilized. The sustainable livelihood framework is then elaborated as a guide for selecting household assets in the AHM.

3.7.1 The Agricultural Household Model

The AHM was first developed to explain why marketed surplus may not be affected by increases in the price of food crops (Taylor & Adelman, 2003). This led to the development of a model in which the production and consumption decisions are linked because households are both producers and consumers. The AHM was developed from the seminal work of Becker (1965), which was based on the unitary household model. In his study, which looks at the allocation of time within households, farm households are assumed to be production units and utility maximizers. As producers, farm households will combine their time and input through a production function to produce basic commodities. As consumers, they will try to find the best combinations of commodities by maximizing their utility function subject to prices and resource constraints. Due to the differences in household capacities, it was concluded that those who are relatively more efficient at production activities would allocate less time to consumption and subsistence activities.

Singh, Squire, and Strauss (1986) extended Becker's model by incorporating a production function into the model. Farm households are also considered as production and consumption units. Decisions regarding production, consumption and labor-allocation are often interdependent. Given the inter-relatedness of these decisions, a household aims to maximize its expected utility, which is subject to several constraints. Within a semi-commercial production arrangement a household produces for its consumption and for sale. The semi-commercial context refers to a production situation where some inputs are purchased and some outputs are sold. The decision-making under such semi-commercial conditions is known as recursive, which means that the household's consumption and labor-allocation decisions depend on the income that is obtained from production and production decisions are based on market prices. In purely subsistent households, who produce solely for their own consumption, the production and consumption decisions are made simultaneously as consumption cannot be greater than the value of production.

The standard rural household model by Singh et al. (1986) has been commonly used to study the determinants of income diversification. In this model the household is assumed to maximize its utility, which is a function of the consumption of goods and leisure, subject to: (a) a cash constraint; (b) production technologies for own-farming and non-farm self-employment activities; (c) exogenous effective prices for tradable; (d) an equilibrium condition for self-sufficiency of farm production; and (e) an equilibrium condition for family labor. The first-order conditions of this model allow the determination of labor allocation to farm and non-farm sectors and self-employment and wage employment.

In the AHM, a household is regarded as a single decision-making unit, which maximizes a single utility function representing the joint welfare of its members (Ellis, 1988). A household is able to maximize its utility assuming the existence of a labor

market, household members are able to earn different wages, the possibility of different farm-gate and retail prices of products and agriculture may not be the only income source. According to Singh et al. (1986) the utility maximization function of a household is:

(1) $U = U(X_a, X_m, X_l)$

where X_a is the household's own consumption of agricultural staple, X_m is a market-purchased good, and X_l is leisure. Utility maximization is subject to a cash income, time and production constraints. The cash income constraint is given by:

$$p_m X_m = p_a(Q_a - X_a) - p_l(L - F) - p_v V + E$$

where p_m and p_a are the prices of the market-purchased goods and the staple, Q_a is the household's production of the staple, p_l is the market wage, L is the total labor input, F is the input of family labor, V is a variable input (such as fertilizer), p_v is the variable input's market price, and E is any non-labor non-farm income. The household is faced with a time constraint because the allocation of time to various activities cannot exceed the total available time:

$$T = X_l + F$$

where T is the total stock of household time, X_l is time allocated for leisure, and F is the input of family labor. The relationship between inputs and farm output is determined by a production constraint:

$$Q_a = Q(L, V, A, K)$$

where L is the total labor input, and V is the variable input, such as fertilizer, A is the fixed input, such as land, and K is the household's fixed stock of capital.

The equilibrium function, which is provided below, combines household expenditure on three consumption items and total household income. The three constraints (cash income, time, and production) are combined into a single constraint function by substituting the production constraint into the cash-income constraint for Q_a, and substituting the time constraint into the cash-income constraint for F (Singh, Squire, & Strauss, 1986):

(2) $p_mX_m + p_aX_a + p_lX_l = p_lT + \pi + E$

where p_mX_m is the value of the market-purchased good, p_aX_a is the value of the household's purchase of its own output, and p_lX_l is the household's purchase of its own labor in the form of leisure, p_lT is the value of the stock of the household's time, π is a measure of farm profit, and E is the non-farm income. The right-hand side of the equation is developed from Becker's concept of full income, where p_lT is the value of the stock of time owned by the household that is explicitly recorded (Becker, 1965). The extension of the AHM is made by including farm profits, π, with all labor valued at the market wage, based on the assumption of a household being a price-taker in the labor market. Therefore, the farm profit has the following factors:

$\pi = p_aQ_a - p_lL - p_vV$

This equation is based on the assumptions that family labor and hired labor are perfect substitutes, a household can sell its own labor at a given market wage, there is a possibility for only a single crop, a household is a price-taker, and the four prices (p_m, p_a, p_l and p_v) in the model are not affected by the household's actions (Singh, et al., 1986; Taylor & Adelman, 2003). The above equations show that households have to decide their levels of consumption for the three commodities and labor allocation, as well as the use of other inputs such as fertilizers. The maximization of a household's

utility subject to the combined single constraint as described above will provide the following first-order conditions:

(3) $p_a (\delta Q_a / \delta L) = p_l$

(4) $p_a (\delta Q_a / \delta V) = p_v$

The above two equations imply that a household will equate the marginal revenue products of labor (L) and variable input (V) to their respective market prices. Therefore, the demand for farm labor and fertilizer can be determined as a function of prices (p_a, p_l and p_v), the technological parameters of the production function, and the fixed land area and quantity of capital. Since equations (3) and (4) represent the standard conditions for profit maximization, it can be concluded that the household's production decisions are consistent with profit maximization and independent of the household's utility function. The functions for output, profits and income are provided by the following equations (Taylor & Adelman, 2003):

(5) $Q_i^* = Q_i (L_i^*, K_i)$

(6) $\pi_i^* = p_i Q_i^* - wL_i^*$

(7) $Y^* = \Sigma \pi_i^* + wT$

In the three equations π_i^* is the maximum profit that can be achieved from activity *i* and Y* is total household income, which is the sum of profits and the household's stock of time. The labor demanded by activity *i*, is represented by L_i^* and *w* is the wage.

The AHM has its application in the studies of livelihood strategies and income diversification of rural households (Abdulai & CroleRees, 2001; Brown, et al., 2006; Escobal, 2001). In a study of livelihood strategies of rural households in rural Kenyan Highlands, Brown et al. (2006) in determining the relationship between assets, income, and selected livelihood strategies have utilized the AHM. Households are assumed to

maximize their utilities which are defined over stochastic income by allocating their asset endowment across a set of feasible activities. It was proposed that if the differences in asset allocation strategies result in different income distributions that can be ordered in welfare terms, then this indicates the existence of barriers to the adoption of higher return livelihood strategies. Formally, in the model, Brown et al. (2006) assumed that:

(1) $y_i = f_i(A_i) + \varepsilon_i$

where f_i is an increasing function that relates household assets in activity *i*, (A_i), to the return from an activity (y_i), with ε_i as an error term that represents unexpected shocks to activity income and any measurement error. The total income for a household is given by:

$Y = \Sigma_i\, y_i$

If the household maximizes its utility which is defined over realized incomes, then the household's choice is simply an optimal allocation of its asset endowment (A_0):

(2) Max $U(\Sigma_i\, y_i = \Sigma_i\, f_i\,(A_i) + \varepsilon_i\,)$ subject to $\Sigma_i\, A_i \leq A_0$

The allocation of assets to various activities will determine the livelihood strategy chosen by a household. With the selected livelihood strategy, a household will compare the marginal utility from various asset allocations, by considering the expected income from a given allocation and the full underlying distribution of each $\varepsilon_{i,}$ which generates a welfare ordering among alternative allocations of asset that would generate exactly the same expected income.

The application of the AHM is in identifying the determinants of rural-income diversification (De Janvry & Sadoulet, 2001; Escobal, 2001). Studies on rural income diversification have been based on the equations specified by Singh et al. (1986) as

described above. Example of studies include studies on households' decision to participate in certain income-generating activities (Abdulai & CroleRees, 2001; Barrett, et al., 2001; Berdegué, et al., 2001; Corral & Reardon, 2001; Lanjouw, 2001), on the levels of income from diversified sources (Reardon, et al., 1992), and on the proportions of farm and non-farm income in total income (Croppenstedt, 2006; Escobal, 2001; Reardon, et al., 1992). The decisions have all been analyzed using the reduced-form equations derived from the household-equilibrium function.

Escobal (2001) in a study on the determinants of non-farm income diversification in rural Peru has utilized the reduced form of the AHM with net income shares from farm, as well as non-farm activities such as self-employment, and wage employment as the dependent variable. The independent variables include prices of inputs and outputs; and the various fixed assets that are available to the household. These assets include fixed farm assets (land or cattle); fixed non-farm assets (experience in crafts or trade); financial assets; human capital (family size and composition by age and gender; and education); public assets (electricity, roads, sewage or drinking water); and finally assets related to the characteristics of the area (agro-climatic condition and land quality).

According to Escobal (2001) the first-order conditions of the household-equilibrium function provided a system of supply and demand functions that enables the determination of labor allocation between farm and non-farm activities. A reduced-form equation of these functions, as used in the study, has the following form:

$$S_{ij} = f(p; Z_{ag}, Z_{nag}, Z_k, Z_h, Z_{pu}, Z_g)$$

where S_{ij} is the share of net farm and non-farm incomes, p is the vector of exogenous prices for input and output, and the Z-vectors are the various fixed assets available to the household with Z_{ag} for farm assets, Z_{nag} for non-farm assets, Z_k for key financial

assets, Z_h for human-capital assets, Z_{pu} for public assets, and Z_g for other key assets of the area. The sustainable livelihoods framework presented in the following section provides a system for specifying the asset variables for the above equation.

The AHM has also been applied in the study of labor supply decisions as an approach to ex-ante and ex-post risk management (Rose, 2001). It can also be extended to include incomplete markets and market imperfections such as differences in rural labor market access and off-farm activities due to the differences in transaction costs, rationing, and entry barriers (Reardon, et al., 2001). Other application include the study on the effects of farm price policy and other types of household-related issues such as income-diversification decisions, nutrition policy, downstream growth, migration and savings (Taylor & Adelman, 2003).

In applying the AHM, the issue of separability between production and consumption has to be determined. According to Singh et al. (1986), in a separable AHM the production and consumption decision of a farm household can be modeled separately assuming there are perfectly competitive markets for labor and other inputs and outputs, the family and hired labor are perfect substitutes in production, and that there is no specific disutility associated with working off the farm. In contrast, a non-separable model is a model where production and consumption decisions are interrelated.

The non-separability of production and consumption decisions may be because the constraints in off-farm employment would result in an incomplete adjustment in the agricultural labor market, imperfect substitution between family and hired labor in agricultural production, and the interest rate charged to the household may depend on the amount of loans as well as on household characteristics. In addition, if the allocation of time to on-farm or off-farm work results in different levels of utility, the production

and consumption decisions are non-separable. Therefore, household characteristics will affect labor allocation decisions of a household. Another implication of the separation of production from consumption decisions in the basic farm household model of Singh et al. (1986), is the treatment of non-farm income as an increase in household income that is available for consumption instead of as a productivity-increasing investment in farm production (Taylor & Wyatt, 1996).

The standard AHM has been criticized for its premises and assumptions. Ellis (1988) claimed that the use of a household as a unit of analysis is that it will ignore the impact of intra-household relations on economic behavior. The standard economic argument of the household model is that it does not address social relationships, such as relationship between household members. In addition, Taylor and Adelman (2003) argued that the household models are a simplification of reality because the models assume that incomes and preferences are shared between household members. The traditional models have also been found to be focused mainly on individual households thus ignoring some features of rural societies which could influence household behavior.

The traditional AHM also assumes perfectly functioning markets, while in the context of a developing country households are exposed to market failures that affect their behavior (De Janvry, et al., 2005). This leads to non-separability of the household model, which means that a household's production decisions are affected by its characteristics as a consumer, such as preferences as well as family size and composition. This differs from the separable model, in which the household can operate as a profit maximizer.

3.7.2 Sustainable Livelihood Framework

The sustainable livelihood framework (SLF) is based on the work of Chambers and Conway (1992), who were the first to propose the concept of sustainable livelihood (Solesbury, 2003). The concept became the center of the approach in the analysis of poverty and/or vulnerability (Bebbington, 1999; Bird & Shepherd, 2003; Chambers, 1995; Moser, 1998). The SLF consists of several characteristics that differentiate it from conventional approaches to the analysis of poverty and well-being. The first characteristic is the shift in the focus of analysis. Studies on household well-being have often focused on the aggregate variables of income or consumption as a measure of well-being. However, the shift of focus to the multiple interactions between household resources and strategies and how these interactions are affected by social and institutional environment(s), have enabled a more detailed analysis of poverty and well-being. The second characteristic of SLF is the emphasis on the individuals' active involvement in shaping their own livelihood. This active role is a break from the traditional view of the poor as a passive marginalized victim (De Haan & Zoomers, 2005).

The livelihood approach is based on the premise that the asset position of the poor is important for understanding the opportunities that are available to them, the strategies they adopt in order to attain their livelihoods, the outcome they aspire and the vulnerability context under which they operate (Ellis, 2000). Household assets provide them with the "capability to be and to act" (Bebbington, 1999). As a consequence, "the poor are also managers of complex asset portfolios" (Moser, 1998). The third characteristic is the inclusion of the element of dynamism into the analysis of poverty and well-being. The multiple interactions between resources and strategies will change through time, resulting in different livelihood pathways. These pathways will also change overtime and the change is very much rooted within the institutional and social

context (De Haan & Zoomers, 2005). The understanding of such characteristics will help to identify areas where restrictions, barriers, or constraints occur and to explain the social process that could have an impact on the sustainability of a livelihood (Scoones, 1998).

The livelihoods approach has highlighted the diversity of activities of rural households, the importance of household assets in determining their ability to participate in activities, the dynamics of rural household actions, and the link between the diversification of assets and activities (Barrett & Reardon, 2000). The approach acknowledges the fact that households tend to use a variety of assets in various combinations of agricultural and non-agricultural activities as part of a livelihood strategy. This also suggests the possibility of multiple paths out of poverty (Haggblade, et al., 2005).

There have been several livelihood frameworks such as those by Scoones (1998), Ellis (2000) and the Department for International Development (2001). The framework by DFID, as shown in Figure 3.1 is often used as a basis for analyzing livelihood strategies. Basically there are five components to the livelihood approach, which are household assets or capital, transforming structures and processes, livelihood strategies, livelihood outcomes and vulnerability context. These components will determine the success of any chosen livelihood strategy. Households with greater access to productive assets will be less vulnerable as they are able to choose strategies in order to achieve their livelihood goals.

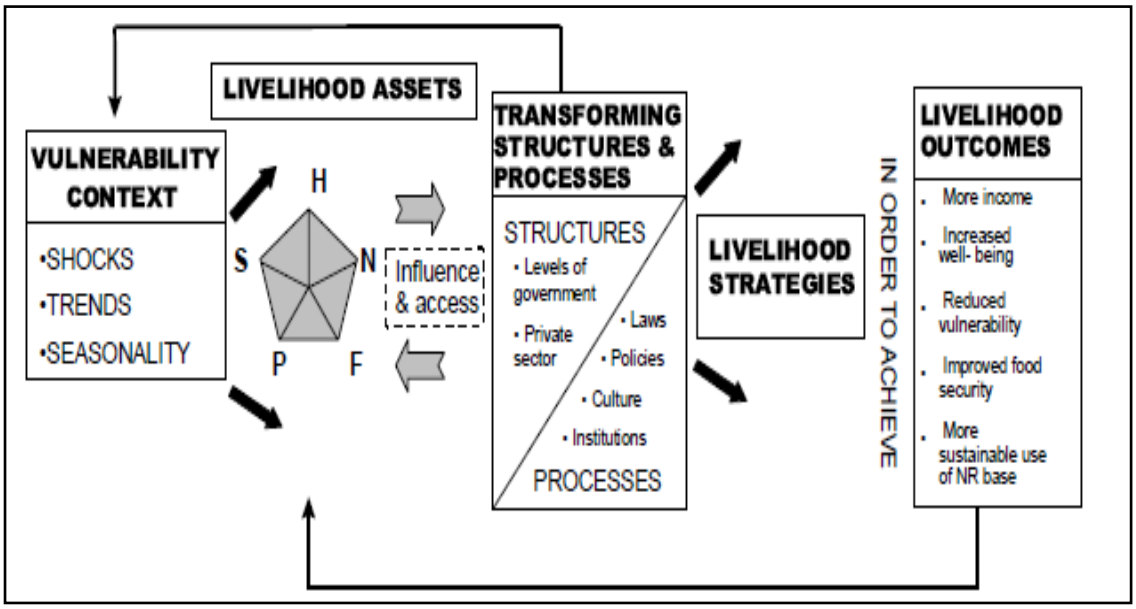


Figure 3.1: The Sustainable Livelihood Framework

N = Natural capital; H = Human capital; S = Social capital; P = Physical capital; F = Financial capital

Source: DFID (2001), Sustainable Livelihoods Guidance Sheet.

3.7.2.1 Household assets

According to the livelihood approach there are five categories of assets or capitals, which are human, financial, social, physical, and natural assets (DFID, 2001). In general, human capital is made up of skills, aptitudes, knowledge, experience, and good health. Human capital in the form of education increases the probability of a household participating in non-farm wage employment (Corral & Reardon, 2001; Lanjouw, 1999). Natural capital consists of land, water, wildlife, and biodiversity. Financial capital comprises of savings, credit, remittances, and pensions. Physical capital incorporates transport, shelter, water, energy, and communications; while social capital includes networks, groups, trust, mutual understanding, shared values, and access to institutions. Physical assets such as electrification, access to roads and potable water have lead to greater participation in non-farm activities as shown by Lanjouw (1999) for rural households in rural Ecuador, which was significant to the selection of a livelihood strategy and the development of small enterprises. This significant effect was

also observed by Corral and Reardon (2001) for Nicaragua and by Lanjouw (2001) for rural El Salvador.

Social capital enhances cooperation among households that is important to the achievement of livelihood goals and in providing informal safety nets. This was observed by Winters et al. (2001) in rural Mexico where social capital was found to have a significant influence on income generation from both farm and non-farm activities. Social capital in the form of local or international migration networks has been shown to increase seasonal migration and overcome the barriers into specific activities (De Janvry & Sadoulet, 2000).

The five categories of assets serve only as a general guide for studying livelihoods. In achieving a livelihood outcome, a single asset category on its own will not be sufficient (Bird, Hulme, Moore, & Shepherd, 2000; Haan & Lipton, 1999). It is the combination of the five general asset categories that will enable the achievement of the desired livelihood outcome. Households without sufficient asset combinations will be vulnerable as they are more susceptible to shocks. Although these external factors are beyond the control of households, the sustainable livelihood that they have developed or chosen based on their asset endowments and opportunities available to them imply that they would be more resilient to the changes brought about by unfavorable shocks.

3.7.2.2 Transforming structures

Another component that affects livelihoods is the policies, institutions, or processes which are also known as transforming structures and processes. This component basically determines a household's access to assets, as it may constrain or support a household's asset endowments and livelihood opportunities, hence the choice of a livelihood strategy. It protects households against the negative outcomes resulting from shocks through conventional measures such as the provisions of reliefs, evacuation

plans and other types of interventions in the form of micro-credits, agricultural extensions, and development projects that indirectly helps build up household assets (DFID, 2001; Morse, McNamara, & Acholo, 2009).

State policies have been found to affect markets. However, the effectiveness of policies also depends on the actions of private institutions such as civil societies and the strength of their relations with the state government. The culture of rural households, specifically the norms that govern individual interactions in formal and informal contracts can also determine the form of market transactions. The past and future policies of a government will influence the level and type of activities among households. Infrastructural investments in roads, schools, health centers, provision of public utilities (electricity, water), and law enforcements will help to reduce transaction costs. As a consequence, this will change a household's choice of activities (Winters, et al., 2001).

The values of certain assets, such as land and water, are affected by policies and laws that govern these assets and the way in which they can be used. The ability of an asset to be converted to another type of asset is also affected by structures, such as institutions and markets, as well as processes, such as legal restrictions. As an example, the use of money, which is a form of financial capital, to pay for education (human capital) is affected by the existence of educational institutions that can produce the required outcomes. In addition, the ability to turn natural capital (land) to financial capital, as collateral for loans, also depends on the land and financial markets.

3.7.2.3 Livelihood strategies

The selection of a livelihood strategy is determined by the assets that a household has access to or has control over, the policy, institution, and processes that affect them and the vulnerability context under which they operate. The combination of

these livelihood components will result in the achievement of an outcome that is expected by a household. Livelihood strategies are not static. They will change as the vulnerability context changes, as policies, institutions, and processes shift and evolve, as access to and control over assets change and as opportunities arise. In addition, an unsustainable and unproductive livelihood strategy may continue due to tradition and habit. A livelihood strategy may also be used as a coping strategy.

Most rural households are involved in some form of diversification in their economic activities. Their livelihoods are no longer dependent on a single activity, such as farming, but more towards the combination of multiple activities in order to manage the risk associated with agricultural production and to enable them to obtain a sustainable income stream. Diversification can be within the agricultural sector itself or diversification out of agriculture, which is the current trend in rural areas of various developing countries. In terms of diversification within the agricultural sector, households' diversification activities would involve the cultivation of higher value crops in addition to the traditional crops. On the contrary, diversification out of agriculture involves the combination of crop production and non-farm enterprises that would result in the improvement of a household's well-being (Barrett, et al., 2001; Ellis, Kutengule, & Nyasulu, 2003).

3.7.2.4 Livelihood outcomes

The chosen activities or the direct use of assets will lead to outcomes such as higher incomes, improvement in well-being, reduction of vulnerability, improvement in food security or a more sustainable use of natural resources. These outcomes can be immediate or only be obvious over time. Agricultural production, for example, can lead to an immediate increase in income and access to food; activities such as communal work, on the other hand, do not lead to immediate income but can lead to future social

claims. Among these outcomes, income is the outcome that is commonly analyzed by various livelihood studies. This is due to the need for income maximization and/or income stabilization as the main motivations of diversification (Winters, et al., 2001).

3.7.2.5 Vulnerability context

The context in which the household operates is the external environment such as seasonality, trends, and shocks that will have a significant effect on livelihoods and outcomes. Seasonality refers to the seasonal changes in factors such as prices, production levels, food availability, and employment opportunities. Trends are long-term and are usually large scale in nature. Examples of trends include population trends, the usage, and acquisition of resources, domestic and international economic trends, as well as political, environmental, and technological trends. Shocks include shocks to human health such as epidemics, natural shocks due to natural disasters, economic shocks such as exchange rate changes, conflicts and livestock or crop pests and diseases. These shocks can lead to the direct destruction of assets as in the case of floods or storms which ruin agricultural land, hence affecting agricultural yield. Shocks may also force households to sell-off their assets as part of their coping strategies. Continuous droughts can affect social and human capital as people are forced to migrate. A household's resilience towards shocks is an important determinant of the sustainability of a chosen livelihood (Morse, et al., 2009).

3.7.2.6 Strengths and weaknesses of the sustainable livelihood framework

The SLF has enabled the identification of important relationships between the different components in the framework. This is important in determining the factors or situation that would be advantageous to the poor or vulnerable households. It is also important in identifying entry points for policy intervention where the poor or vulnerable households can be assisted in achieving their livelihood outcomes (Carney,

et al., 1999). By highlighting the variety of assets that households utilize in their livelihoods, the SLF is able to provide a more holistic view of the type of resources that are crucial to the poor. This also enables a better understanding of the causes of poverty through the identification of factors that have the potential to determine or constrain the poor's' access to resources and consequently their livelihoods.

There have also been criticisms to the SLF. The framework does not really provide a way of identifying the poor households that require assistance. In other words, the element of people is only implied in human capital, as well as in institutions and policies. This has resulted in the SLF being merely a quantitative listing of assets and activities (Morse, et al., 2009).

The measurement and analysis of capitals in the framework are also not clearly specified. Although the types of household assets are provided by the asset pentagon but each of the asset categories consist of various elements making up each of the asset categories. The framework does not suggest any means of measuring the assets. In addition, if measurement is required, the issue would then be should all the elements in an asset category be measured or only a few? If the measurement is for a few elements then which elements should be measured? Given the ambiguity regarding the selection and measurement of asset elements, therefore, livelihood studies have based the selection of assets on country-specific context. As an example, land is an important asset for a farm household. Therefore, should land area be measured? However, a more essential question would be what measurement to be used? This is due to the fact that land ownership is more complex in reality as a household may own many parcels of land which can be located in various areas with varying distances from the place of residence. Another related complication regarding the measurement of land is the availability of land access through rent or gift, which can be considered as capital in one particular year but may not be available the following year (Morse, et al., 2009).

The SLF could provide a detailed analysis but a more pressing issue is the translation of these analyses into policy interventions that would help the vulnerable households, in particular, the poor. According to the framework, a sustainable livelihood strategy is beneficial to the poor if they also have the power to bring about change. However, power relations are often unequal within a community (Fadzilah, 2004). As a consequence, some households may be able to adopt a livelihood strategy that would improve their well-being, while others may not be as adaptive.

A livelihood strategy is a result of the combination of a household's asset endowments that would determine the type of activities that a household is able to combine and the intensity of involvement in each activity. Therefore, these combinations of assets and activities will reflect the type of livelihood strategy chosen by a household. The asset endowments, on the other hand, may be affected by the vulnerability context and policy changes which will in turn affect a household's livelihood selection. Households may choose to be engaged in agricultural production or non-farm activities as a livelihood strategy and achieve higher incomes, hence an improvement in well-being, as a result of their decision. The diversification of livelihood strategies through multiple activities is chosen as a risk-coping strategy and as a way of achieving a sustainable income stream over time.

3.8 Asset and diversification

Rural households earn their incomes from various sources depending on how they allocate their assets to the various income generating activities (Abdulai & CroleRees, 2001; Barrett, et al., 2005; Ellis, 1998). According to Barrett et al. (2001) households hold their wealth in several forms and use their assets in multiple activities.

Empirical studies on rural livelihoods and distributional consequences of non-farm employment have often taken an asset-based approach, which is also an approach utilized in this study. The discussion in this section is on the determinants of livelihood strategies in particular factors that determine a household's participation in non-farm activities as diversification in this study refers to diversification out of agriculture. The effect of relevant factors on income inequality will also be discussed. Following the discussions for each factor, relevant hypotheses will be offered.

Previous empirical studies have shown that the differences between survival-led and opportunity-led diversification is important in understanding the effect of each determinant on household participation decision in non-farm employment. Farm households may be 'pushed' into non-farm activities to ensure their survival or they may be 'pulled' into non-farm activities by their desire for asset accumulation. The focus of income diversification studies involving non-farm income have mainly been on household assets rather than household behavior towards risk in explaining household resource allocation over time. Therefore, the discussions on participation factors have mostly revolved around the asset endowments of rural households (Reardon, et al., 1998). The results from these studies indicate that the asset position of a household has a significant effect on the choice of off-farm activities. Consequently, greater understanding of the factors affecting participation decisions and their relative importance in different off-farm activities may contribute to better policies for raising and diversifying rural household income and improving risk management.

The way a household manages its asset portfolio represents its livelihood strategy. Households' asset endowments will determine their choice of a livelihood strategy (Reardon & Vosti, 1995). Households living in a small area may be relatively homogenous in terms of natural and physical asset endowments but they may be highly heterogeneous in terms of human and financial asset endowments. The accumulation of

assets and the selection of livelihood strategies are important drivers of sustained improvements in household well-being. It is the linkages among these assets that are important, especially in the management of risk by vulnerable households (Siegel & Alwang, 1999).

The following sections are discussions on various empirical findings on each asset categories – human, natural, physical, financial, social as well as locational capitals. In general, the effects of these assets on income diversification and distribution may vary depending on country-specific conditions.

3.8.1 Human capital

3.8.1.1 Education

The effect of education is very clear: the higher the education level, the greater the participation in non-agricultural activities in general and high-return activities in particular (Ferreira & Lanjouw, 2001; Lanjouw, 2001; Van den Berg & Kumbi, 2006). This also implies a lower incentive to obtain income from farming and the greater the incentive to commit time to non-farm employment (Escobal, 2001). In other words, education is a pre-requisite for diversification into and getting substantial returns from non-farm wage employment (Davis, et al., 2007). Studies on household diversification into non-farm activities have often found that returns to education in the non-farm sector have been higher compared to returns to education in agriculture (Lanjouw, Quizon, & Sparrow, 2001; Lanjouw & Shariff, 2004; Reardon, et al., 2001; Van de Walle & Cratty, 2003). The lack of skills and education among the poor is one of the barriers to entering high-return non-farm activities (Barrett, et al., 2001). Different types of employment have different education and skill requirements. However, due to the limited number of non-farm employment opportunities, farm households with higher education and skills will have better chances of obtaining non-farm employment (Kung

& Lee, 2001; Zhang, Huang, & Rozelle, 2002). The level of formal education has been found to have a positive effect on participation in non-agricultural activities (De Janvry & Sadoulet, 2001; Taylor & Yunez-Naude, 2000; Xia & Simmons, 2004; Yúnez-Naude & Taylor, 2001), especially on high-return activities such as wage employment (Berdegué, et al., 2001; Ferreira & Lanjouw, 2001; Lanjouw & Lanjouw, 2001; Stifel, 2010).

Davis et al. (2007) found education to have a positive significant effect on household participation in non-farm wage employment hence resulting in higher non-farm wage income. In contrast, education is negatively related to participation in agricultural-wage employment which leads to a significant reduction in agricultural-wage income. Furthermore, agricultural-wage employment is a form of refuge employment to the poor and the relatively poorly educated. Education has also been linked to a shift to non-farm wage employment. This was observed by other studies such as those by Lanjouw et al. (2001) for Tanzania, Berdegué et al. (2001) for Chile, Elbers and Lanjouw (2001) for Ecuador, Winters et al. (2002) for Mexico, Isgut (2004) for Honduras and De Janvry et al. (2005) for China. In terms of household participation in farm activities, education has a negative effect on participation decision but not necessarily on the level of income earned from farming (Davis, et al., 2007).

Having a higher education is only a necessary condition but not a sufficient condition for securing non-farm employment. Depending on the availability of non-farm work, these jobs may have to be "rationed" among the better-educated workers who are interested in obtaining them. If they fail to secure the employment, they will have to continue with farming, which is an occupation where education does not necessarily bring about any comparative advantage to the workers. Although the best farmers may be the least educated; literacy has been found to have a small effect on percapita income due to their diligence and industriousness (Kung & Lee, 2001).

Education not only reflects better opportunities and higher returns, but also higher barriers to better remunerated non-farm activities. The study by Lay et al. (2009) in Burkina Faso for the period of 1998 to 2003 found that there is a shift to more sophisticated, skill-based activities for generating income from the non-farm sector. In terms of livelihood strategy, rural households with higher levels of education tend to choose dominant livelihood strategies consisting of only non-farm activities and a strategy that combines farming and non-farm activities (Ansoms & McKay, 2010; Brown, et al., 2006; Iiyama, et al., 2008; Stifel, 2010). On the contrary, households with less education are most likely to adopt the least remunerative livelihood strategies consisting of agricultural-wage employment and family farming.

Given the positive relationship between household participation in non-farm activities and education, poor households with low levels of education generally face greater barriers than the non-poor in their choices of high-return livelihood strategies (Dercon & Krishnan, 1996; Evans & Ngau, 1991). Studies have found that the level of education, in particular the education of the head of household, can also have a significant negative effect on non-farm self-employment income. This may be due to the informal nature of the non-farm enterprises where education is not as important (Abdul Malek & Usami, 2009).

Within the Malaysian context, Norsida and Sadiya (2009) showed that although greater years of schooling do increase the probability of participating in off-farm work, education is not a significant factor influencing participation in off-farm employment in granary areas of MUDA in Kedah and Kemasin Semerak in Kelantan. These households have the tendency to participate in low return activities due to the unavailability of high-return employment opportunities in the granary areas. This was also observed by Shi et al. (2007) for China where education was found to have a significant positive effect on migration, which is a common finding in migration studies. However, education does

not affect self-employment and local wage employment due to the limited availability of employment opportunities in local enterprises and the dominance of migration in the area. Therefore, the importance of education on a rural household's decision with regard to their participation in non-farm employment is affected by the availability of non-farm employment opportunities in an area.

De Janvry and Sadoulet (2001) in their study of income strategies among rural households in rural Mexico observed that among spouses of the household head, those who participate in non-agricultural-wage employment also have a higher level of education. They are also younger, indicating that younger adults are better educated than older adults. Among young males and females with non-agricultural employment as their main job, education is also higher: 7.3 years for men and 8.2 years for women. This is in contrast to those who participate in the agricultural-wage labor market as their main activity, where years of education are only 5.3 years for men and 3.0 years for women. Older household members who are not household heads display the same regularity: those in the non-agricultural-wage labor market are more educated (7.0 years) than those in the agricultural-wage labor market (5.0 years). Non-agricultural self-employment is also positively related to educational levels for the young (7.1 years for males and 7.8 years for women). The study concluded that there are significant positive effects between education and both non-agricultural-wage employment and self-employment.

Education provides an exit path out of low-paying agricultural-wage employment. In rural Peru, Escobal (2001) showed that the higher the education level, the lower the incentive to allocate time to farming but a higher incentive to allocate more labor time to non-farm self-employment activities as well as non-farm wage employment. Corral and Reardon (2001) as well as Ferreira and Lanjouw (2001), through the use of probit regression analysis of rural household participation in non-

farm activities in rural Nicaragua and Brazil respectively, found that higher education have a positive significant effect on a household's ability to secure high-return non-farm wage employment. However, education does not have a significant effect on non-farm self-employment in Nicaragua. According to Corral and Reardon (2001), this may be because the products of the local firms only cater for local tastes using traditional technologies. Farm households with low educational attainment and unskilled farm households are only able to secure employment in jobs with low educational and skill requirement, therefore, earning low income from their non-farm activities (Smith, Gordon, Meadows, & Zwick, 2001).

Winters et al. (2002), as with De Janvry and Sadoulet (2001), included the education levels of males and females in their study on the effects of social and public capitals on household incomes in land reformed rural areas of Mexico. This is to highlight the simultaneous role of assets on income generation. The results from the probit regression suggest that higher levels of male education are negatively related to livestock income but positively related to non-agricultural-wage employment and crop income. These results are similar to the general conclusion by Taylor and Yunez-Naude (2000) that returns to schooling vary across activities. The study concluded that the returns from education differ across gender and that the return to education is observed primarily through non-agricultural-wage employment and crop production.

In general, education has a poverty reducing effect. This has been observed by Roslan et al. (2010) in rural Terengganu. The greater the number of educational years of the head of household, the lower is the probability of a household being poor. As a consequence of the link between poverty and low levels of education and skills, education seems to be a significant factor contributing to the greater ability of wealthy families to diversify (Ellis, 2000). As previously noted, higher education levels will enable individuals to secure employment in higher return activities. On the other hand,

poorer households, who are often associated with low education levels, are more involved in lower-pay easy-entry agricultural labor market such as farm wage employment. Low education and constraints in terms of credit and cash have been identified as reasons for their participation in activities of this nature. By contrast, richer households with higher education and with lesser credit and cash constraints are commonly found in high return non-agricultural employment (Abdul Malek & Usami, 2009; Berdegué, et al., 2001; Escobal, 2001). Examples of such high-return employments include employment in handicraft industries, hotels and restaurants, information and communication services, commerce, salaried jobs with government organizations and private companies, tools and machinery repairs and agro-processing.

Most of the studies of household income diversification have mainly considered the education level of the household head. The effect of schooling of other household members on household income has often been ruled out within the context of farm households. This would lead to an underestimation of the effect of education on household income. The level of education of all family members will affect the allocation of investment within activities and hence the returns from such activities. As an example, Taylor (1983) found that in rural Mexico, the children's education affects their likelihood of migration and participation in other non-traditional production and wage employment. This provides the households with new income sources. If the returns to education from these activities are high then the education of household members other than the head of households would have a positive effect on participation and income level.

The children's education may increase the profitability from farming if educated children are able to influence farmers' resource allocation decisions. However, the increase in children's education may not result in farmers leaving farm production activities as they have comparative advantage in farming. Furthermore, the costs as well

as the risk of leaving traditional production activities in favor of new ones are likely to be high. An increase in the education of the household head may actually be a pre-requisite for lifting the constraints but lock farmers into traditional production activities. The education of other working members can have a weaker effect on household income compared to the effect of the education of the household head. This is because parents may only receive a share of the benefits from children's education. This was observed in households with migrating children and having extended families (Taylor & Yuñez-Naude, 2000).

Yang (1997) in a study on education and off-farm work in China suggested that better educated household members may contribute to agricultural management while participating in off-farm wage employment and that schooling increases off-farm wage rates. This shows that these household members have a comparative advantage in off-farm employment. Their participation in these activities based on their education level would result in income maximization. However, if the lower educated members are assigned to wage work and the better educated to working on the farm then the comparative advantage principle will be violated. This indicates that the households will not be able to benefit from the wage differentials among household members with different educational level in non-farm employment.

In modeling the significance of schooling on household income, the selection of an appropriate measure for a household's level of educational attainment is important. Jolliffe (2002), in determining the appropriate measure for a household's level of educational attainment concluded that the educational attainment of the head of household is not an efficient measure of educational attainment for the entire household. The findings show that the maximum level of educational attainment should be used in estimating total household income. In addition, the average or median education level is suggested as a more efficient measure in the estimation of farm and off-farm incomes.

3.8.1.2 Household composition

The size and structure of a household can have an ambiguous effect on household participation in non-farm activities (Corral & Reardon, 2001; Reardon, 1997). Larger household size enables households to allocate more labor to non-farm activities. In terms of percapita income, larger households have also been found to be poorer (Croppenstedt, 2006). In addition, large households also experienced land constraints, hence, forcing them to find non-farm employment to ensure their survival. Nonetheless, household size may only have a small positive effect on the share of incomes from wage employment and household enterprise activities as observed by Croppenstedt (2006) for rural Egypt. Ansoms and MacKay (2010) found that large households that are rich in natural capital (land area and livestock) in rural Rwanda are not involved in any specialization. The large number of adults of working age in the family has lead to greater involvement in non-agricultural activities. Woldenhanna and Oskam (2001) in their multinomial logit regression of farm households' choices between non-farm activities in Ethiopia, showed family size has a positive effect on household participation in non-farm employment in general. More specifically, the effect of family size is significant for non-farm wage employment but it is weak for non-farm self-employment.

In contrast, Van de Walle and Cratty (2003) in studying the poverty reduction effect from the Vietnamese rural households' participation in the rural non-farm market have found household size as having a significant positive effect on participation in non-farm self-employment. Holding other characteristics constant, an additional household member increases the share of self-employment hours and the probability of participating in self-employment. An additional household member increases family expenses hence adding to the need to find work outside the family farm.

In terms of number of dependents in a household, it has also been shown to have an ambiguous effect on participation in non-farm employment. Dependents in a household consists of children below the age of 15 years old and older household members who are above 65 years old. The number of young children in a household can have a significant negative impact on migration. The presence of young children in a household makes it difficult to be involved in employment outside of a region, hence, limiting migration. However, this does not affect participation in non-farm employments which are within the vicinity of the household's location, such as self-employment and agricultural employment (Shi, et al., 2007; Zhu & Luo, 2006). This is because young children still require routine care which prevents parents and other family members from participating in non-farm wage employment.

Another group of dependents in a household is aging parents. The presence of aging parents or relatives in a household has resulted in greater migration. This is especially true in China where children are raised to a large extent by their grandparents as both parents have full-time jobs. The results indicate that the presence of grandparents makes it easier for parents to find employment in non-farm activities (Lay, et al., 2009; Shi, et al., 2007). Therefore, the number of dependents may have a positive but not significant effect on participation in non-farm employment.

Woldenhanna and Oskam (2001) found a significant positive relationship between the number of dependents and the probability as well as the level of participation in non-farm wage employment. This shows that as the number of dependents increase the greater will be the probability and level of participation in the non-farm sector and hence the level of non-farm income. These results imply that farm households' involvement in non-farm wage employment is due to push factors such as insufficient income and the availability of surplus labor. Therefore, the non-farm wage

employment is considered as a residual employment that absorbs the surplus family labor, which cannot be fully employed on the family farm.

In an assessment of off-farm employment decision among 500 paddy farmers in the Muda Agricultural Development Authority (MADA) and Kemasin Semerak granary areas of Malaysia, Norsida and Sadiya (2009) found that the number of dependents has a significant positive correlation with off-farm employment decision. The positive coefficient indicates that a farmer is more likely to participate in off-farm employment as a way of supplementing the family's income as the number of dependents increases. The respondents were divided into three types of households based on the number of dependents – respondents with three dependents, between three and six dependants and more than six dependents. For all these three categories of households, the effect on the likelihood of participating in off-farm employment has been significantly positive with the greatest effect for households with more than 6 dependents.

Another household characteristic that has an influence on household participation decision in non-farm employment, hence the level of non-farm income is the number of working labor in a household. The number of working household members has been shown to have a significant positive impact on non-farm employment (Abdul Malek & Usami, 2009; Abdulai & CroleRees, 2001). However, it has a significant negative impact on agricultural off-farm employment (Shi, et al., 2007). Farm households require a minimum level of labor for on-farm agricultural activities to be used for land cultivation and crop harvesting. It would be easier to combine local wage employment and self-employment with farm agricultural activities. As the number of working adults in a family increases, more labor can be allocated to non-farm employment in other areas. However, the availability of non-farm employment opportunities also affects a household's labor allocation decision (Norsida & Sadiya, 2009). The lack of local non-farm opportunities, for example, in the Jiangxi Province of

China have been found to cause the surplus laborers in that area to migrate rather than be involved in other types of off-farm employment (Shi, et al., 2007).

Age also affects a household's income diversification decision. A negative coefficient of age indicates that an individual's participation declines as his or her age increases. In other words, the probability of participation in off-farm work increases at younger ages, but it will decrease as individuals get older (Abdulai & CroleRees, 2001). Terano and Fujimoto (2009) discovered that age was a crucial factor in determining the choice between on-farm and off-farm employment, as well as being full-time or part-time farmers in Seberang Perai, Penang. The younger generation preferred working off-farm, and younger farmers chose to be part-time farmers.

Shi et al. (2007), Zhang et al. (2002), Kung and Lee (2001) and Lay et al. (2009) also found age to have a significant impact on off-farm employment. For agricultural-wage employment and local non-farm employment, age has a positive sign while the lifecycle effects (age square) are all negative (Shi, et al., 2007). This means that, up to a certain age, older individuals are more likely to work in these two types of off-farm employment than younger individuals. On the other hand, for migration and self-employment, age is found to have a negative impact, which means younger individuals are more likely to migrate and to be self-employed than older individuals.

Corral and Reardon (2001) discovered a negative effect of the age of household head on the supply of labor to off-farm wage employment. There is a greater supply of labor to off-farm wage employment by younger households due to population pressure that have resulted in them having insufficient land to support their livelihoods. On the other hand, the lack of participation from older farmers may be due to the fact that they do not have off-farm experience as they may be prohibited from entering the off-farm

wage labor market. Therefore, they have greater experience and tradition with working on-farm. This also implies greater on-farm compared to off-farm production.

Lay et al. (2008) pointed out that as the age of household head rises, the share of agricultural income increases significantly while the share of income from non-agricultural employment drops sharply. This was observed for both low-return and high-return non-agricultural activities. This can be attributed to the norms of traditional land subdivision and inheritance in Western Kenya, where older household heads have better claim to land resources (Jayne, et al., 2003). This provided them with an edge in agricultural activities. On the other hand, the younger household heads will have to depend on non-agricultural strategies to secure their livelihoods. Younger household members prefer to be involved in low- and high-return non-agricultural activities rather than in agriculture. It was also observed that for each additional year of age, the probability of participating in non-agricultural employment would decline by 3 percent for low-return activities and 5 percent for high-return activities. The study concluded that age does not seem to affect the choice between low- and high-return activities.

There have also been studies that have utilized the average age of married couples instead of the age of household head to study the effect of age on participation in non-farm employment (Berdegué, et al., 2001). Results from the probit participation model of rural households in Chile reveal that households of older couples have greater probability of earning non-farm income from self-employment and non-farm wage employment. Winters et al. (2002) on the other hand, found that younger households (as measured by the age of household head) have greater tendency to participate in agricultural-wage employment while older household members are more inclined to receive remittances and greater participation in crop production.

Based on previous studies on the effect of human capital on non-farm participation this study seeks to determine the effect of human capital components on a household's income from non-farm income source. In order to evaluate such a relationship, the study proposes the following hypotheses:

H_2: *Average education of working household members has a significant positive effect on the level of non-farm wage income.*

H_3: *The number of working household members has a significant positive effect on the level of non-farm wage income.*

3.8.2 Natural capital

Natural capital consists of natural resources such as land, soil, water, forests and fisheries. This category of asset is usually measured by the size of a farm household's total land holdings or total cultivated land area (Ansoms & McKay, 2010; Jansen, et al., 2003). Total cultivated land consists of land owned and other land area that are accessible to farm households through rental, sharecropping arrangements or any other means of access. In general, the level and share of farm income will increase as farm size increases while the share of off-farm income decreases with farm size (De Janvry & Sadoulet, 2001). This is because as the share of farm income in total household income increase it will decrease the need to undertake wage-employment in the farm and non-farm sectors (Escobal, 2001). The landless, on the other hand, have been found to have a substantially higher share of non-farm income as they mainly depend on non-farm employment (Estudillo, et al., 2001).

Land can serve as collateral which will reduce the costs associated with searching for credit (Van de Walle & Cratty, 2003). Therefore, land holdings have been shown to be an important determinant of household participation in non-farm self-employment. Conversely, the size of owned cultivated land has been shown to have a

negative significant effect on household participation in non-farm activities. This means that the smaller the size of landholdings the greater the probability of participating in non-farm employment. This would suggest that poorer and landless households are more likely to participate in non-farm employment as observed by Van den Berg & Kumbi (2006) for Ethiopia. More importantly, the size of landholdings is important to the determination of the type of diversification strategy to be adopted by a rural household. Smaller land holdings in rural Ecuador, for example, have resulted in household participation in low-return non-farm activities while households with greater landholdings were found to have used their land as collateral for investment in high-return non-farm self-employment activities such as businesses (Elbers & Lanjouw, 2001).

Abdul Malek and Usami (2009) in their study on the determinants of non-farm income diversification in developed villages of Bangladesh also found a positive effect of landholding size on non-farm self-employment income. This may be due to the possibility that in developed rural areas, landholdings are important for farming and also as a source for the accumulation of financial capital, which is used for establishing rural non-farm enterprises. This implies that households with larger landholdings are more likely to earn income from non-farm activities. However, the study found that land poor households, who are also poor in terms of financial, human and migration capital, are more likely to earn income from low-return non-farm wage employments, such as non-farm hired daily labor. The inequality in access to scarce land results in the inequality in non-farm employment opportunities. This is because agricultural incomes and wealth in the form of landholdings are also determinants to non-farm business start-ups (Reardon, et al., 2000).

Adams (2002) in analyzing the determinants of incomes for rural Egypt through the marginal effects obtained from the Tobit regression of income found that an increase

in the amount of land owned have the largest positive effect on the level and share of agricultural income, especially from commercial agriculture and livestock. However, an increase in land owned causes a statistically significant reduction in percapita non-farm income level and share. These findings suggest that while agricultural income is positively related to land ownership, non-farm income is not linked to land ownership and therefore more important to the poor. Intuitively, having more cultivated land could have an ambiguous effect on diversification. Households may increase their participation in self-employment through a wealth effect. It would also result in a lower probability of participation due to the inability to hire labor to work the land, hence leaving the household with not much time for off-farm activities. This would result in a substitution effect away from non-agricultural activities (Ansoms & McKay, 2010; Van de Walle & Cratty, 2003).

An increase in the size of landholdings percapita had been found to have a significant negative effect on agricultural-wage and non-farm wage incomes in Nicaragua (Corral & Reardon, 2001). This suggests that these wage employments are a form of compensation for land constraint. Conversely, this variable has a weak positive effect on non-farm self-employment. This was also observed by Berdegué et al. (2001) for Chile and Van de Walle and Cratty (2003) for Vietnam. Land may serve as collateral that would increase household capacity to undertake non-farm self-employment by serving to overcome capital barriers for starting non-farm businesses. In addition, land also produces farm income that is a substitute for non-farm income. Although households with larger percapita landholdings are less likely to participate in non-farm employment, this is not necessarily true in areas where highly desirable non-farm jobs are rationed. In such conditions it is the households with more land who will be better off in securing the jobs (Lanjouw, 2001).

Lay et al. (2008) as with Elbers and Lanjouw (2001), observed that there is a drastic decline in the share of income from low-return activities as landholdings increase. On the contrary, the share of household income from high-return activities increases with the increase in the size of landholdings. One explanation for this observation is the fact that land is the main asset for many rural households. Therefore it serves multiple functions such as crop cultivation, livestock production, a store of wealth, a source of rental income and as collateral for securing loans (Omilola, 2009). This finding supports the view that land endowments play a key role in explaining both survival-led and opportunity-led diversification strategies.

In addition to land ownership, land access also affects diversification strategies. Stifel (2010) found a rather ambiguous effect of access to land on the choice of household strategies in Madagascar. Households who are poor in landholdings may not be faced with entry barriers into livelihood strategies that include off-farm activities. Those with more land are less likely to adopt a strategy consisting of agricultural-wage activities as they would prefer to allocate their labor to family farming. This is similar to the observation by Lay et al. (2009) that land is an important agricultural input for farm households. The landless are capable of choosing either to be involved in low-return agricultural-wage activities or high-return non-farm activities depending on other assets, such as education, that may allow them to overcome the barriers to participation in non-farm activities. This implies that off-farm activities are relatively more important to households with fewer land assets. This also suggests that the ability to participate in off-farm activities is important to the land-poor (Berdegué, et al., 2001; De Janvry & Sadoulet, 2001).

The size of cultivated land, which includes owned and rented land, can have an ambiguous effect on total household income. As total household income is made up of farm and non-farm incomes, the increase in total household income may come from the

increase in the size of cultivated area, which would increase the farm income component. However, in areas where agriculture is still labor-intensive, a larger farm size would require greater labor hours from household members for farming activities, hence, leaving lesser labor time available for farm-wage employment and non-farm activities (Berdegué, et al., 2001; Shi, et al., 2007; Zhu & Luo, 2006). Therefore, households with larger farm size will have a lower proportion of income from non-farm activities. But there are studies that have found households with larger farm size also have a high proportion of its income from non-farm activities. This is because they have the ability to hire laborers to carry out farming activities thus relieving their time for more lucrative non-farm employment (Abdulai & CroleRees, 2001; Lay, et al., 2008; Stifel, 2010).

Based on previous studies on the effect of landholding size on the level of non-farm income and the selection of diversified livelihood strategies this study proposes the following hypothesis:

H_4: *The size of cultivated land has a negative effect on the level of non-farm wage income.*

3.8.3 Physical capital

Physical capital is composed of productive assets such as tools, equipment, and work animals; and non-productive assets consisting of household assets such as housing and household goods. Livestock has often been categorized as physical asset because households with livestock ownership are able to increase the productivity of their land and labor. Another role of livestock is as a form of self-insurance (Ansoms & McKay, 2010). In general, high return non-farm activities would often require certain types of capital that asset-poor households are not able to provide (Abdulai & CroleRees, 2001; Dercon & Krishnan, 1996; Woldenhanna & Oskam, 2001). Barrett (1997), for example,

discovers that rural households who lack access to machinery and other equipment would not enable them to enter profitable niches in the non-farm sector especially in non-farm self-employment.

In general vehicles, equipment, and machinery have been found to increase the productivity of labor and variable inputs in agriculture (Jansen, et al., 2006; Van den Berg & Kumbi, 2006). Households owning more machinery and equipment are less likely to use family labor but tend to use more hired labor in crop production. This may be due to the high opportunity costs of family labor time and the ability of farmers to hire labor. Ownership of machinery and equipment has also been related to higher value of perennial crop production and higher percapita income. Jansen et al. (2006) in assessing the determinants and effects of household livelihood strategies and land management decisions among rural households in hillside areas of Honduras, found that machinery ownership provide the highest returns to the livelihood strategies of farmers who are basic grains/farm workers, coffee producers, and diversified basic grains/livestock/farm workers. Larger values of machinery and equipment owned have enabled a household to put its land and labor to more productive use, hence generating more income. This is especially important for households with relatively high opportunity costs for its labor.

Owning more machinery and equipment would result in a positive effect on the probability of participating in non-farm employment. This was observed by Berdegué et al. (2001) in their study of household participation in non-farm activities and non-farm income level in rural Chile. The comparison between a well-developed agricultural area and a poor potential agricultural area shows that ownership of equipment and machinery has enabled households to provide agricultural services to other farmers in the area hence providing higher agricultural self-employment income for the farm household. However, having these assets also means that households do not have to participate in

non-farm wage activities, hence, reducing the proportion of income from this income source. On the contrary, the existence of an agricultural service market especially in large granary areas, have facilitated the reduction in household participation in agricultural-wage employment. This is despite the ownership of farm equipment and together with the availability of non-farm employment opportunities; it has caused an increase in the opportunity costs of laborers operating farm machinery. As a consequence, households will prefer to purchase agricultural services to enable them to participate in non-farm activities (Ji, Yu, & Zhong, 2012).

3.8.4 Financial capital

Financial capital includes savings, income from employment, trade, remittances, transfers, and credit. One of the problems of rural households in developing countries is credit market failures. Farm household participation in non-farm activities enables them to generate cash income as a substitute for the absence or high cost of credit. Consequently, the cash generated are used to purchase inputs for farm production and indirectly help households in managing unstable income as well as reducing household risk-aversion in farm production decisions (Eswaran & Kotwal, 1990). Households without access to formal credit have a higher probability of adopting an inferior livelihood strategy, which include agricultural-wage employment. They are also less likely to diversify out of agriculture. For these households, credit market failure may serve as a barrier to selecting high return livelihood strategies (Stifel, 2010).

Access to formal credit has no significant effect on non-farm income diversification (Abdul Malek & Usami, 2009). This may be true in developed rural areas where despite the availability of credit access to rural households, the local formal credit providers are not able to meet the demands of the locality. However, access to farm credit can have a significant positive effect especially on non-farm self-

employment. Households with access to more funds tend to use them or other funds that may be freed by having access to credit, partly for diversifying their income (Berdegué, et al., 2001; Escobal, 2001). Consequently, household involvement in non-farm activities serves as a way to accumulate savings to substitute for the absence of credit markets (Brown, et al., 2006; Dercon & Krishnan, 1996; Ellis, 1998; Stifel, 2010). According to Escobal (2001) credit access is a key determinant of self-employment in the farm and non-farm sectors. This is because non-farm income sources relax the cash constraint as substitutes for credit or credit constraint.

The existence of non-earned sources of income such as transfers from pensions and remittances will reduce the likelihood of participating in off-farm employment, which include agricultural-wage and non-farm employment (Abdulai & CroleRees, 2001; Norsida & Sadiya, 2009). Van de Walle and Cratty (2003) discovered that the receipt of remittances by households in Vietnam does not have any effect on household participation in off-farm activities due to severe credit constraints. Similar findings have also revealed a lower probability of self-employment as pensions are received primarily by the elderly or handicapped.

In countries where rural households are quite involved in migration, whether in local or international migration, remittance does play an important role in a household's income. Studies in these countries tend to separate the effects of remittance from local and international migration on income diversification. As an example, in a study on the determinants of income diversification among 214 rural households in Bangladesh by Abdul Malek and Usami (2009), it was discovered that remittance from international migration contributes up to 20.1 percent to total household income while from local migration the contribution of remittance is about 6 percent. In terms of transfers, households with working members (both male and female) are less likely to receive this category of unearned income. Female-headed households are more likely to have higher

income from remittances and other transfers. Despite the contribution of remittance to household income, this income category has a significant negative effect on non-farm self employment income. This may imply that the remittance received is not being invested productively, such as in non-farm enterprises.

The significant effect of credit access and receipt of remittances on the selection of livelihood strategies was also observed by Brown et al. (2006) in their study of livelihood strategies of 240 rural households in Kenyan highlands. Credit access and remittances are the only statistically significant determinants of a household's decision to participate in a livelihood strategy that combined high-return and diversified commercial strategy. Their ability to diversify into higher return activities is a function of their relatively greater financial liquidity, which was made possible by their greater credit access and income from remittances. This finding is consistent with previous studies on the importance of financial liquidity to livelihood choice and household welfare (Barrett, et al., 2005; Dercon & Krishnan, 1996; Ellis, 1998).

The accessibility of households to cash, credit and also infrastructure have also been found to differentiate the composition of rural non-farm incomes in equally poor areas such as West Africa and South Asia (Escobal, 2001). Credit access has been identified as a key determinant of self-employment in the farm and non-farm sectors. This is because the existence of non-farm income reduces the households' cash constraints because it functions as a substitute for credit. On the contrary, the lack of credit access may also cause households to resort to borrowing from neighbors and relatives as well as selling their durable assets. In addition, if these mechanisms do not provide them with a sufficient safety net, households will tend to be more cautious in their production decisions. Farmers may prefer traditional crops over more riskier but more profitable high yielding varieties and wage labor is preferred over riskier but more profitable business ventures (Morduch, 1994).

Households without access to formal credit tend to adopt less remunerative livelihood strategies which mainly consist of agricultural-wage employment. These households have also been found to have lesser tendency to combine family farming and non-farm activities. This means that credit market failure will be a form of barrier to these households in adopting higher-return livelihood strategies (Stifel, 2010). In addition, households may also engage in non-farm activities as a way of generating cash to substitute for the absence or high cost of credit for the purpose of purchasing farm inputs or making agricultural investment (Ellis, 1998).

Based on previous studies on the effect of credit access on household participation in non-farm self-employment, this study proposes the following hypothesis:

H_5: *Having borrowing experience has a positive significant effect on the level of non-farm self-employment income.*

3.8.5 Social capital

Households use various combinations of assets to maintain their livelihoods. However, the economic outcomes of the chosen livelihood strategies are different and cannot be fully explained by the differences in traditional inputs such as labor, land, and physical capital. Social capital is another asset that has until recently received increasing recognition as one of the important assets affecting household well-being or livelihood strategies and thus community development. It enhances a household's ability to participate in different types of income-generating activities. Unlike the common definition of capital in economics as assets that would produce definite flows of income or benefits to those who utilize them, social capital, on the other hand, provides benefits to both individuals and groups of individuals (Uphoff & Wijayaratna, 2000).

The most common measure of social capital in income diversification studies is a household's participation in training and extension programs as well as in formal or informal organizations such as producer organizations, financial organizations, non-governmental organization (NGO) projects, and community groups. Among the livelihood studies that have utilized the use of such measure are those by Ansoms and McKay (2010) and Jansen et al. (2006).

Throughout the literature, there has yet to be an agreement on the components of social capital and its measurement (Woolcock & Narayan, 2000). In general, social capital is represented through human relationships and includes any networks that would result in greater trust, ability to cooperate, access to opportunities, informal safety nets, and organizational membership (Jansen, et al., 2006). Woolcock and Narayan (2000), as well as Grootaert et al. (2004) however, have suggested three categories of social capital: bonding, bridging and linking which vary by context. The bridging and bonding aspect of social capital are based on the relationships among people of about the same social standing. This is also referred to as horizontal connections. Within a society, there is usually a social group that is isolated from another group with different characteristics. The weaker group will not be able to access the resources of the stronger group. Therefore, the weaker social group will not have sufficient social assets for bridging but it will be able to bond. The linking aspect of social capital is concerned with connections between individuals and key political agents, institutions and power bases. This would provide vulnerable households with access to the linking aspect of social capital. These are also known as vertical connections (Woolcock & Narayan, 2000).

Three methods have often been used to measure social capital. The first approach involves the creation of a single numerical index that is a weighted average of the relevant set of variables. This is in view of the different components of social

capital. A higher value for the index implies greater social capital. Among the studies that have applied this approach are those by Krishna & Uphoff (1999) for India, Narayan and Pritchett (1999) for Tanzania, Grootaert (2001) for Bolivia, Burkina Faso and Indonesia, Nega et al. (2007) for Northern Ethiopia and Roslan et al. (2010) for Malaysia. In using this approach, strong and arbitrary assumptions are required about the weights to be assigned to each variable in the construct. In addition, the utilization of a single index is assumed to be sufficient in representing social capital. Winters et al. (2002), however, have criticized the use of a single index as it will ignore the possibility of the three types of social capital. It was further observed that even if there is a possibility of using multiple indexes to measure the various components of social capital the definition of the various indexes will still be arbitrary.

Narayan and Pritchett (1999) in their study on the effect of social capital on household income in rural Tanzania measured social capital by constructing a social capital index which was based on three dimensions of social capital: membership in groups; characteristics of the groups in which households belong to; and individual's values and attitudes, in particular their definition and expressed level of trust in various groups and their perception of social cohesion. Using instrumental variable estimates, the study found that the social capital effect on income is much higher compared to the effect by human capital (in particular schooling) and physical assets. The "trust" variables do not affect income directly; however they do contribute to higher village social capital. On the other hand, an increase in household group membership has been found to increase household income. Another significant observation is that the social capital of a household also has an effect on the incomes of other households in the village in addition to their own incomes. The study also suggested that household members in villages with greater social capital have greater access to better public

services, more likely to utilize advanced agricultural practices, to participate in communal activities and to use credit for investing in agricultural improvements.

Social capital has also been studied in terms of its effect on poverty reduction. It has been found to have a positive significant effect on household income, hence has an important role in alleviating poverty and reducing inequality (Gazi Md., Yew, Nik Mustapha, & Viswanathan, 2011; Nega, et al., 2007; Roslan, et al., 2010). In their study on the effect of social capital on the probability of households being poor using a sample of 2,500 rural households in Terengganu, Roslan et al. (2010) developed a social capital index based on social capital items as suggested by Grootaert et al. (2004). The six social capital components include - i) groups and networks, ii) trust and solidarity, iii) collective action and cooperation, iv) information and communication, v) social cohesion and inclusion, and vi) empowerment and political action. Using the social capital index in a logit regression a household's social capital was found to reduce its probability of being poor.

The second approach to measuring the social capital variable is to use all or a subset of the variables directly. This approach was utilized by De Janvry and Sadoulet (2001) in their study on the determinants of income in rural Mexico. Lanjouw et al. (2001) in their study of non-agricultural earnings in peri-urban areas of Tanzania constructed a number of village level measure of social capital. The dimension of social capital include the respondents' membership in non-family groups and characteristics of the groups; number of hours spent on village communal activities per month and their perception of village cohesion and level of trust. A single village level effect for each of the social capital variable was then constructed. In general, social capital does not have a significant effect on business earnings. However, community involvement was found to have a negative effect on earnings. This is because the time and other responsibilities required for being involved in income-generating activities can be at odds with the

demand that stems from the households' high participation rates in their communal activities.

Following Grootaert and Narayan (2001), Nega et al. (2007) have used an additive index to construct a social capital index using three variables: membership density, heterogeneity of membership and participation level. Social capital has been found to have a positive effect on non-farm income but not on crop income. It was noted that social capital in the form of networks and trust among members in a society could enable households to overcome some of the barriers to more remunerative employment and hence reducing inequality. However, social capital can also have a negative effect on income especially if the norms and tradition in a society result in the polarization or segmentation of society and can create barriers to household access to lucrative activities.

The use of a single index as a measurement of social capital was also criticized by Winters et al. (2002) by highlighting the problem in deciding which variables would adequately represent the presence of social capital. Another weakness of this approach is the problem with the degrees of freedom and multicolinearity if too many variables are used in a regression analysis, as it will result in less precise estimates (Greene, 2008).

Given the problems associated with the above two approaches, the third approach involves the use of factor analysis in the measurement of social capital. This method was used by Ansoms and McKay (2010) in a quantitative analysis of poverty and livelihood profiles in rural Rwanda, Gazi et al. (2011) in their study on the contribution of household assets on fishers' household income in Bangladesh, Onyx and Bullen (2000) in measuring social capital from five Australian communities and Winters et al. (2002) in studying the effect of social and public capital on income

generation in rural Mexico. In a comparative study involving a fishing community in Bangladesh, Gazi et al. (2011) constructed a social capital index with variables being determined by principal component analysis (PCA). Four variables with high factor loadings were identified - membership in non-government organizations and other local associations, ability to participate in making decisions, level of knowledge, and influence on securing access to economic activities. Among the variables, membership in organizations was found to be the most important social capital component to income generation.

Winters et al. (2002) in analyzing the role of social and public capital in income generating activities among 972 Mexican rural households explained social capital as comprising of both vertical and horizontal social relations that facilitate income generation. Since social capital is made up of various components, factor analysis was used to incorporate the multiple variables. By applying Lee's generalization of Amemiya's two-step estimator to a simultaneous equation model the study concluded that social capital plays an important role in households' income-generating activities and that the influence depends on the type of social capital as well as the type of income-generating activity. The lack of formal production arrangements, for example, appears to limit specific types of income such as crop, livestock, and self-employment income. The existence of a formal production arrangement has a positive effect on the level of household income. These results show that the types of social capital matter. Formal organizations and production arrangements are indicators of social capital because they measure associational activity. However, only an association with productive oriented organizations has a positive influence on income.

In spite of the positive relationship between social capital and total household income, the relationship between social capital and the performance of the rural non-farm sector may not always be positive (Lanjouw, et al., 2001). A society's formal and

informal ties, which developed through norms and traditions, can lead to the development of segments in the society and form barriers to lucrative activities (Narayan, 1999; Nega, et al., 2007). The development of a non-farm sector in rural areas may require the development of commercial networks that involves the establishment of anonymous and different relationships outside of rural areas. These unfamiliar ties could serve as barriers to participation in non-farm activities as rural households may lack the required networks. The existence of a strong social network may also be a threat to the establishment of non-farm activities with the imposition of excessive claims on successful households thus dampening individual initiatives and entrepreneurial development in rural areas (Narayan, 1999; Woolcock & Narayan, 2000).

Specific social capital components have also been analyzed in terms of their effect on household participation in non-farm activities. Income diversification studies in rural China which include the importance of social and political connections to non-farm employment have found that farm households with fewer social connections or fewer connections to local policy makers will have difficulty gaining access to employment in rural township and village enterprises as well as private enterprises or other local non-farm activities (Giles, 2006; Xia & Simmons, 2004; Yao, 1999; Zhang & Li, 2003; Zhao, 2003). However, local non-farm employment opportunities from private enterprises are primarily allocated by market mechanisms, hence social capital and political connections will not have a significant role (Kung & Lee, 2001).

Household memberships in agricultural related organizations, such as rural cooperatives and farmer associations, are also a form of social capital to rural households. This is because of the differences in the facilities provided to members and non-members. However, Abdul Kader and Usami (2009) did not find any significant effect of social capital variables (access to organization and access to relatives, friends

and neighbors) on the share of non-farm income among households in developed rural areas of Bangladesh. This may be due to the fact that the social capital formed by the rural organizations is not intended to contribute to household income diversification. Kung and Li (2001) in their study of inequality in rural China have also found that social capital or networks do not assist households in gaining access to non-farm employment. Hiring decisions are based primarily on merits and educational attainment rather than personal considerations. This creates an environment that enables farm households to compete with non-farm households in securing job opportunities. This also implies that social capital does not have any significant effect on inequality (Morduch & Sicular, 2002).

Based on the empirical evidence on the effect of social capital in income-generating activities this study proposes the following hypothesis:

H_6: *Social capital has a positive significant effect on the level of income from agricultural-wage employment and non-farm self-employment.*

3.8.6 Locational capital

Locational and infrastructural capital is another asset category that has an important role in income generation. However, this group of asset is beyond the control of households and hence is not affected by household decisions. These assets include measures of distance to various public services, the level of community infrastructure and direct household access to publicly provided infrastructure. Examples include distance and time to the nearest urban center, number of rural and urban centers within 1 hour of travel, share of paved roads, availability of a meeting room, telephones, public lighting, public schools, access to piped water, electricity, and sewage (Jansen, et al., 2006; Winters, et al., 2001).

Greater access to infrastructures implies closer proximity to markets and urban centers and households with greater access will have greater opportunities compared to those with less access, as they may be limited to agricultural activities. The importance of general infrastructure, access to markets, and the state of a local economy to rural diversification has continuously been emphasized in diversification studies (Escobal, 2001; Lanjouw, 2001; Reardon, 1997; Reardon & Taylor, 1996). Most empirical studies have found that paved roads, efficient communication facilities, and provision of rural electrification are crucial to household participation in non-farm employment (Lanjouw & Feder, 2001). Households living in areas that are richer and have better infrastructure would be able to earn higher income due to greater access to non-farm employment opportunities. This was observed by Winters et al. (2002) where it was found that in rural Mexico, non-agricultural and agricultural-wage incomes are positively related to the level of infrastructure. In addition, Davis et al. (2007) also observed a significant positive effect of access to infrastructure on non-agriculture self-employment activities. However, infrastructural access has a negative effect on participation in agricultural-wage activities suggesting that it is a primary activity for households living further away from town centers. Infrastructural access is also negatively related to participation in crop and livestock production since these activities also occur farther away from town centers.

Areas with access to electricity, public lighting, water, and paved roads, which are all general indicators of economic development, are able to provide higher wage employment income than those without. This is because households in these areas have substantial access to these types of infrastructure which also means they have access to more income generating opportunities (Abdulai & CroleRees, 2001; Winters, et al., 2002). However this does not occur in the Coastal region of rural Peru, as observed by Escobal (2001) where the share of wage income and non-farm self-employment income

was found to be higher in the poorer regions. This would suggest that the "push" factors are more important drivers of diversification in poorer regions. On the contrary, households in poor agricultural zones as represented by low average land productivity have also been found to have a lower share of non-farm income in their total household income. Higher land productivity, on the other hand, have resulted in higher non-farm income shares in overall incomes.

Rural towns have been noted as a focal point of non-farm income-generating activities (Davis, 2003; Ellis, 1998; Evans & Ngau, 1991; Haggblade, et al., 1989). These towns serve several economic roles: as market outlets for locally produced goods as well as employment centers for rural labor. The attraction of rural towns to people from surrounding areas has resulted in the development of services to cater for their needs such as hotels and restaurants, vehicle repair workshops, petrol stations, and retail outlets. Rural towns also provide better conditions for the development of agro-processing industries and other manufacturing industries. This is because of the availability of administrative and support services, concentration of consumers, and better access to transport and public utility. There are also enterprises that manufacture agricultural inputs and the provision of essential support services. Finally, rural towns can function as important links between remote rural areas and more distant markets by playing the role of intermediate marketing centers (Davis, 2003).

Household location or its proximity to main trade centers or transport hubs also affects a household's access to non-farm activities as location will determine market access and linkages to the formal sector. Households living near trade centers such as rural towns or urban centers have greater access to off-farm employments (Corral & Reardon, 2001). Differences in household location would cause considerable variations in the share of income from these activities (Berdegué, et al., 2001; Evans & Ngau, 1991; Lay, et al., 2008). Households living in peri-urban areas would have a greater

share of their total income coming from the non-farm sector in particular from employment in high-return activities as competition in the non-farm sector in these areas is greater (Barrett, et al., 2005; Corral & Reardon, 2001; Ferreira & Lanjouw, 2001; Lanjouw & Feder, 2001).

In a more specific effect of proximity to markets and participation in non-farm activities, Berdegué et al. (2001) and Van den Berg and Kumbi (2001) found that household location has different effects on household participation in non-farm activities. Households living closer to markets have greater probability of being involved in non-farm employment. However, the availability of good roads may bring in greater competition from urban areas hence replacing the locally produced goods, such as cheap wine from Chile, with items of superior quality from urban areas. The poor quality roads in rural Chile have provided some form of protection to the agro-industrial activities. The poor road conditions have also increased the transaction costs for households to engage in higher-paying jobs outside of the area. It also discourages household investment in the production of higher quality wine which would require easier access to markets. In contrast, Van den Berg and Kumbi (2006) observed that households who live closer to these roads are more likely to participate in activities that are less affected by urban competition, such as food or drinks businesses. Xia and Simmons (2004) have also noted that poor infrastructure facilities would restrain the movement of labor due to the high cost of migration.

Remoteness may affect the set of livelihood strategies that are available to households through its effects on transaction costs and the determination of the degree of access to markets and market information. Using travel time to the nearest city as a proxy for remoteness and transaction costs, Stifel (2010) found that an increase in travel time to a major city in rural Madagascar have caused rural households to be more inclined to combine family farming activities with non-farm activities rather than

relying solely on family farming. This is because agricultural output can be more easily marketed to urban areas than in less remote areas, while competition in the non-farm sector is greater in the vicinity of urban areas (Lanjouw & Feder, 2001).

In contrast, Canagarajah et al. (2001) concluded that remoteness does not discourage participation in non-farm activities as long as the overall regional infrastructure is well developed to allow them to access non-farm employment opportunities. Rural entrepreneurs have the tendency to reside in less remote areas which is an advantage to their entrepreneurial undertakings. It was also observed that the participation of households in rural Rwanda in off-farm activities may be facilitated by their location in less remote areas which are closer to public services. However, this does not necessarily mean that they are able to secure employment in high-return activities as it was found that the aggregate incomes and expenditures of this group of households are low (Ansoms & McKay, 2010).

Berdegué et al. (2001) found that zone variables (roads, participation in economic organization, landholdings, irrigation or government transfers) and location variable which are based on household location in richer or poorer areas do not have any significant effect on the probability of earning non-farm income or household participation in non-farm employment. However, these variables do have significant effects on the level of total non-farm earnings especially the location variable. Households located in an area characterized by low rural poverty, rapid economic growth and agricultural modernization earn more non-farm income compared to households living in a poorer area.

Terano and Fujimoto (2009) as well as Siti Hadijah et al. (2012) have noted that the ability of households to earn higher non-farm income is also attributable to the characteristics of an area. These studies found that the employment structure in their

study villages in Penang and Kedah have been affected by their geographical advantage of location within commuting distance of the industrial zone. In addition, improvement in infrastructure such as roads and highways has resulted in a significant impact to the study villages through the provision of transportation services by bus companies and the establishment of factories. This has lead to an increase in household participation in non-farm employment.

Proximity to an urban centre is found to be negatively related to agricultural-wage employment and remittance income in rural Mexico. This may reflect the fact that households living in isolated areas would have few off-farm options other than agricultural-wage employment or migration. However, households living in a semi-urban setting are more likely to participate in self-employment and non-agricultural-wage employment due to greater opportunities available to households living in these areas. The receipt of remittance income was less likely in semi-urban areas and negatively associated with infrastructures which suggest that in remote areas with limited off-farm opportunities, dependence on external transfers might be the only alternative source of income. A positive relationship between household access to infrastructure and self-employment was observed in areas with many micro-enterprises as they require minimal infrastructure access (Winters, et al., 2002).

Based on the empirical evidence on the effect of locational capital on household participation in non-farm activities this study proposes the following hypothesis:

H_7: *Household location in Panchang Bedena has a positive significant effect on the level of incomes from non-farm wage employment and non-farm self-employment.*

3.9 Household assets and income distribution

In general, the sources of income growth in rural areas have been attributed to the technological change and productivity growth in agriculture resulting from the Green Revolution, as well as higher earnings from non-farm employment. Each of these sources of income growth has separately generated discussions regarding factors that have contributed to such growth. However, there are very few studies into the equity consequences and the determinants of inequality resulting from rural income sources.

Studies of income inequality in various developing countries have identified agricultural income as the main source of inequality while non-farm income has been found to have an inequality decreasing effect (Adams, 2002; Cheng, 1996; Nega, et al., 2007). This is because agricultural income is a major component of total household income. Further decomposition of agricultural income reveals that land ownership is the main contributor of agricultural income inequality and hence total income inequality. Incomes from non-farm activities, on the other hand, have an ambiguous effect on income inequality. Non-farm income decreases inequality if it is more important to the poor. However, non-farm income will have an inequality increasing effect if it mainly accrues to the non-poor households. The differences in the importance of non-farm income to the poor and non-poor households depend on their asset endowments. Therefore, it is the differences in their assets which are the main determinants of the different distributional effects of non-farm incomes.

The size of landholdings and total cultivated area has often been found to be the main source of inequality in rural areas. According to Leones and Feldman (1998) households that already have some land and some capital from agricultural enterprises are in the best position to take advantage of income-earning opportunities in non-farm enterprises. In addition, the existence of different income groups in the community has

reinforced the inequalities and these inequalities have been found to be correlated with access to agricultural land.

Adams (2002) in a comparative study using nationally-representative household data sets from Egypt and Jordan observed that non-farm income was found to have very different impacts on inequality in the two countries. Land ownership has been identified as the main cause for such differences. All of the cultivated land in Egypt is fully irrigated and highly productive. However, this type of land is very scarce as rural Egypt has a much greater number of rural households compared to Jordan. This has resulted in only a small segment of the rural households who are able to actually own land. A majority of the poor are forced to find employment in the non-farm sector. In the case of Jordan, only 30 percent of its cultivated land is irrigated and crop yields are low. Therefore, rural households in Jordan are found to be more involved in the non-farm sector. The findings from this study confirm the strong relationship between land, non-farm income and the poor. The lack of land ownership in Egypt is shown by the higher Gini coefficient for land ownership as compared to the Gini coefficient for income. The regression-based inequality decomposition reveals that agricultural income inequality is positively related to landownership in rural Egypt, which is unevenly distributed in favor of the rich. On the contrary, landownership has a small contribution to non-farm income inequality, which is similar to the findings by Senadza (2011) for rural Ghana. This indicates that non-farm income is more important to the poor.

Shi et al. (2007) and Yao (1999) have observed that the scarcity of arable land has lead to the development of township and village enterprises and public enterprises. These enterprises are the major driving force for economic growth in rural areas hence providing higher rural household income. This has also resulted in greater income inequality between areas in rural China.

As with other studies on the effect of non-farm income on inequality, findings from studies is Malaysian rural areas have also found an uncertain effect of non-farm income on the distribution of rural household income in Malaysia. Shand (1987), in a study of income distribution in the rice growing area of Kelantan, found that, in terms of contribution to total household income, non-farm income is more important to households with the smallest landholding compared to households with larger landholdings. However, the inequality of non-farm income is high within a given landholding stratum. This is due to differences, especially in start-up capital, education, and skills. The study also revealed that the overall Gini coefficient was close to the farm income Gini coefficient, although the non-farm income Gini coefficient was very high. The examination of income distribution over different sizes of landholdings and over households in each of the landholdings showed that two factors were working in opposite directions, hence cancelling the effect of non-farm income on overall income inequality: (i) the drastic reduction in non-farm income share as landholdings increase such that non-farm employment offsets the unequal distribution of land; and (ii) the high non-farm income inequality within each landholding stratum, and the similarity of the degree of that inequality over landholding strata, which implies that barriers into skilled jobs are neutral with respect to landholding.

Fredericks and Wells (1978) observed that the existence of income inequality in a community that is homogenous in terms of culture and ecology, such as households in a farming community in Sawah Sempadan, Selangor, is an indication that inequality is due to other factors such as the effect of double-cropping due to differences in landholding sizes and the availability of access to non-farm activities. Ishida and Azizan (1998) concluded that although most farmers in a granary area have experienced an increase in income as a result of the Green Revolution, however, the unequal distribution of government subsidies in favor of large farms have forced small farmers

to find alternative sources of income. Therefore, the reliance of small farmers on off-farm employment has reduced income inequality.

Arayama et al. (2006) revealed that non-farm labor income decreases overall inequality among farm households in Korea while farm income increases overall inequality. Through the use of the regression-based method of decomposing income inequality, it was found that differences in family size and composition as well as land ownership are responsible for the inequality in total household income. In particular, the contribution of family size and land ownership is through their effect on the inequality in farm income, while family composition, which is represented by the fraction of working age males and females in a family, contributes through its effect on non-farm labor income. In addition to family composition, education also contributes to inequality through its effect on non-farm labor income. Senadza (2011) found that more educated households tend to be more involved in non-farm wage employment in rural Ghana. Education was the most important contributor to the inequality-increasing effect of non-farm income especially for non-farm wage income. Household size was also an important factor to the inequality in non-farm income. Yao (1999) further suggested that the sharp increase in income inequality among rural households should be mainly attributed to the differences in skills, knowledge, and capital endowments, which have created disparities in the opportunities of participation in non-farm activities.

Social capital is an important asset influencing household participation in non-farm activities and hence, the distribution of income. The level of social connections and trust in a society can either have a positive or a negative effect on the reduction of income inequality. This would depend on the coverage of trust and connections. Social capital will have an equalizing effect on income distribution if the level of trust and connections in a society has a wider coverage and helps greater flow of information among members. However, without trust and connections, the level of inequality will be

higher. If the benefits of social capital are experienced by network members, they will benefit from any increase in efficiency compared to non-members. According to Durlauf and Fafchamps (2004), club memberships tend to have undesirable consequences on equity if (i) club membership is beneficial to members only and (ii) entry into the club is not instantaneous. Uchimura (2005) in a study on the influence of social institutions on inequality in China has shown that the decline in importance of informal family social security has lead to a reduction in income sharing of households and hence a significant impact on income inequality. In addition, Nega et al. (2007) also observed that in a study involving 385 rural households in Northern Ethiopia, social capital has an inequality increasing effect as it is important to non-farm income.

Nega et al. (2007) revealed that income from crop production contributes a larger share (56 percent) to total income followed by non-farm (34 percent) and livestock (10 percent). Therefore, the largest contribution to overall income inequality comes from agricultural income accounting for 56 percent of the inequality followed by non-farm income accounting for 34 percent. However, the percentage contributions of the different income sources to overall income inequality was found to vary due to locational factors, availability of agricultural production facilities and agro-ecological zones. It was observed that areas located in the lowland have a higher share of agricultural income hence this type of income tends to contribute the most to income inequality (70 percent of the overall inequality). Areas located in the highland have higher contribution to income from non-farm activities hence non-farm income contributes more to overall income inequality.

3.10 Summary of theoretical framework and literature review

Household diversify their income voluntarily or involuntarily by increasing the number of their income-generating activities. Income diversification is undertaken as a

way of managing risk, smoothing income flows, increasing the efficiency of labor usage as a response to market failures, and enhancing their food security. The motives of diversification will contribute to the maximization of a household's utility.

This study utilizes the AHM and SLF in order to analyze household income strategies. The AHM was discussed to explain the economic behavior of rural households. The utility maximization goal of a household is made up of various components of a household's behavior, such as agricultural production for its own consumption or sales, leisure, purchases of goods from the market, time, and resource allocation to non-farm activities for income and food security.

According to the SLF, a household's asset endowments can be grouped into five categories: human, financial, social, physical, and natural assets or capitals. The lack of these assets will limit a household's access to the most remunerative economic activities. Under different conditions, asset endowments and constraints, different income generating strategies will be chosen by households. These strategies involve the combination of farm and non-farm activities.

Different income source will have different effects on overall inequality. The combination of household assets with various income-generating activities will therefore affect the contribution of these income sources on overall inequality. In general, variables affecting income generation will also determine the level of income inequality. Although there is a list of household assets that may explain the variations in income sources, for the purpose of policy priorities it is necessary to rank the variables in terms of their relative contributions to total inequality and the inequality among various income sources. This would then require the decomposition of overall inequality.

The reviews on the theoretical and empirical literature resulted in the proposition of hypotheses for the study. The next chapter describes the design of the conceptual framework which forms the basis for data collection. It also describes how data was collected and analyzed.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

The focus of this study is on rural household income generation and diversification. Diversification refers to a process in which households voluntarily or involuntarily increases the number of economic activities they are involved in, either within the agricultural sector itself or in the non-agricultural sector. However, for the purpose of this study, diversification refers to diversification out of agriculture. This chapter basically explains the methodology used to answer the research questions of this study. The first section of the chapter starts with the description of the conceptual framework, which is established from the review of theoretical and empirical evidences on the determinants of livelihood strategies involving rural households' participation in non-farm activities. This is followed by an explanation of terms used throughout the study. The second section is on the identification and measurement of the dependent as well as the independent variables used in the econometric analysis. The third section presents a description of the study areas, sampling frame and household selection, data collection, as well as data entry, and cleaning. The final section is on data analyses which deals with (i) the methodology used in cluster analysis; (ii) a description of the various econometric models used in analyzing the effects of household assets on the selection of livelihood strategies; and (iii) the methodology for determining overall income inequality and the decomposition of overall inequality by income sources and household assets.

4.2 Conceptual framework

Previous livelihood strategies of rural households have highlighted the importance of household assets in affecting the livelihood outcome, in particular income from the chosen livelihood strategy. However, these studies have often included only a

few categories of household assets. The theoretical foundation for the present study – the Agricultural Household Model (AHM) and the Sustainable Livelihoods Framework (SLF) – which are presented in the previous chapter, have been used to develop the conceptual framework for the study, as shown by Figure 4.1.

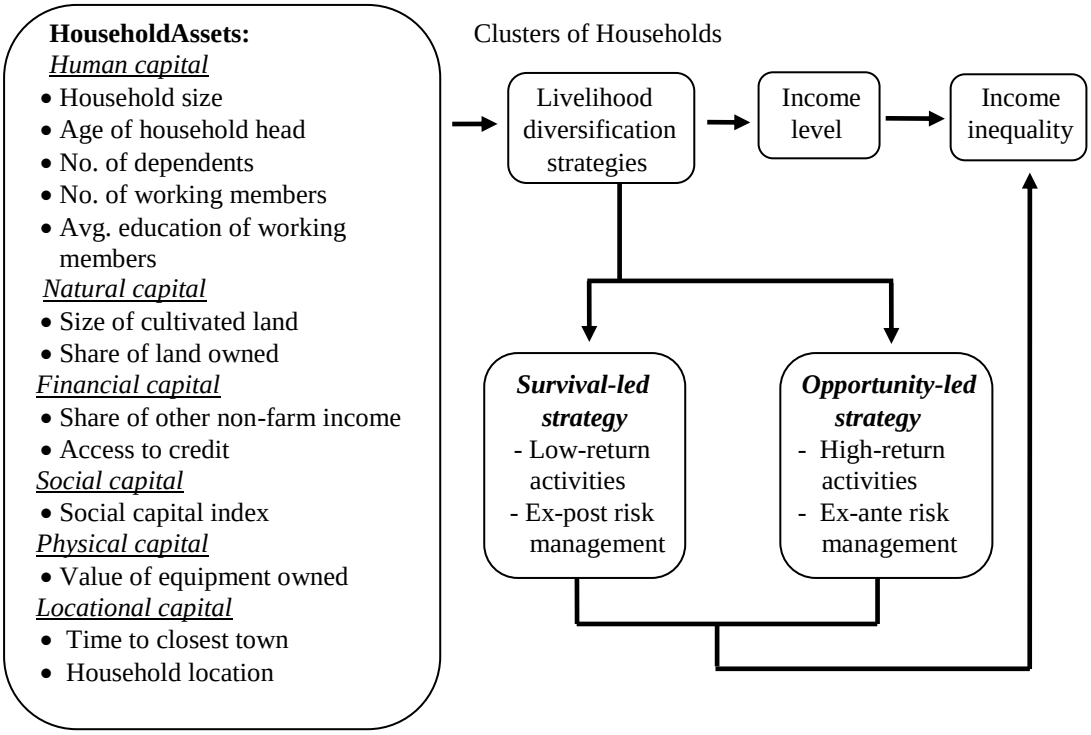


Figure 4.1: Conceptual framework

Source: Adapted from Ilyama et al. (2008)

A household's selection of a livelihood strategy would contribute towards its utility maximization. In addition, the availability of opportunities in terms of labor demand, the production of goods and services by households and the level of competition are important to a household's chosen portfolio of incomes. Different income diversification decisions will result in the differences in income distribution among households. This is because income portfolios have tended to differ among households in the lower and higher income groups.

There are basically five categories of household assets which are human, natural, financial, social, and physical assets, as provided by the SLF. These assets can be

controlled and are affected by household decisions. In addition, there is also a locational capital, which is not affected by household decisions, but is an important asset that affects the distribution of income. The combinations of assets and activities will determine the livelihood strategy chosen by a household. In general, there are two types of livelihood strategies: survival-led strategy and opportunity-led strategy. Different livelihood strategies will result in different levels of income, which will have distributional consequences in rural areas.

4.2.1 Definition of terms

This study utilizes the definition used by Ferreira and Lanjouw (2001) in distinguishing between high-return and low-return non-farm activity. The definition is based on the average monthly income earned from such an activity. If the average monthly income earned from a particular activitiy is below the poverty line, the activity is designated as a low-return activity. Therefore, households who are employed in this type of activity are regarded as being involved in low-return, last resort activity. On the contrary, if the average monthly income earned from a particular activity is above the poverty line, the activity is designated as a high-return sector.

A household is considered to be specializing in a particular activity if it earns more than 50 percent of its income from the activity while it is categorized as being highly specialized in an activity if it earns more than 75 percent of its income from the activity. This definition was also utilized by Eneyew (2012) and Swift (1988) in categorizing pastoralists in selected African countries.

Based on the definitions used in the Tenth Malaysia Plan and the Government Transformation Plan (GTP), poor households are defined as households that earn a total income of less than or equal to RM800 per month, which is the national poverty line income. The low-income household, on the other hand, are households with monthly

incomes of less than or equal to RM2,000 per month, while the high-income households are those with a monthly income of higher than RM2,000. Another method of classifying households is by using income groups as suggested by the Economic Planning Unit (EPU) in the 10th Malaysia Plan. Households in the top 20 percent income group are those who have an income of greater than or equal to RM5,600 per month; middle 40 percent group as those with an income that is greater than RM2,300 per month but less than RM5,599 per month, and the bottom 40 percent group as those with a monthly income of less than RM2,300.

This study utilizes income data despite the weaknesses that have reduced the usefulness of income data such as annual income instability, recall problems, tendency for income under-estimation and lack of record keeping. Income under-estimation may be due to recall problems because people have the tendency to forget their income portfolios; reluctant to reveal their total income; and reluctant to admit to receiving illegal income (Ravallion, 1998). The use of income data in this study is based on two reasons. First, income rather than consumption data is used because consumption data is more difficult to collect without adequate monitoring. Although consumption is a better indicator of current and long-term welfare, it is more related to well-being rather than to income (Carvalho & White, 1997; Ravallion, 1992). Second, expenditure data will not enable the analysis of diversification behavior in income and assets especially when there is a need to disaggregate by sectoral income, by individual or both (Alderman, 1993). In other words, the use of income data allows the identification of various sources of household incomes from diverse livelihood activities. In particular, it enables the differentiation of income from farming and off-farm activities which include agricultural-wage and non-farm employment.

In terms of the reliability of the income data collected for this study, the presence of field officers from the Area Farmer Association, who are familiar with the

farmers in the study areas, has enabled the interviews to be conducted in a trustworthy environment. As a consequence, a relatively accurate comparative analysis of the respondents' farm and non-farm incomes was possible. Furthermore, the pilot survey that was conducted prior to the actual survey and the use of a structured questionnaire have provided an overall picture of the respondents' income sources and the amount generated from their livelihood activities.

The household is the unit of analysis as there is greater income diversity for a household than for an individual (Stifel, 2010). A household is taken as a single decision-making unit. The definition of household used in this study is the one used by the Malaysian Statistics Department in the Population Census for the year 2010, where: "A household consists of related and/or unrelated persons who usually live together and make the common provisions for food and other essentials of living".

4.3 Measurement of variables

The grouping of households into livelihood clusters will allow the explanation of a livelihood choice based on a set of predetermined asset-based variables which include natural, human, physical, financial, and social as well as locational capital. The following subsections are explanations of the dependent and independent variables used in the study.

4.3.1 Measurement of dependent variables

In general, the dependent variables can be grouped into two categories which are (i) the probability of choosing a specific livelihood cluster and (ii) total household income as well as the levels and share of each income source in total household income. The level of household income refers to the household's total income earned from different sources. Separate models were estimated for (i) the probability of a household

belonging to a certain livelihood cluster (ii) the level of total household income for the whole sample as well as for each livelihood cluster and (iii) the levels and shares of incomes from farm, agricultural-wage, and non-farm employments. The share of farm and agricultural-wage incomes in total household income will enable the identification of factors affecting diversification within the agricultural sector. Conversely, the shares of non-farm wage and non-farm self-employment incomes will provide information on the determinants of diversification out of agriculture. In order to compare the effects of each explanatory variable between the models, a common set of explanatory variables are used.

In determining the probability of a household belonging to a specific livelihood cluster rural households are assumed to be rational decision makers and the activities that they choose will maximize their utility from the income they expected to receive from these activities. Therefore, livelihood strategies do not have any specific order or ranking among them. Furthermore, it is better to treat outcomes as if no order exists unless there is a good reason for imposing ranking among them (Borooah, 2001). Households would achieve the maximum level of utility from the adoption of a livelihood strategy, which is basically defined by the characteristics of their assets and the expected outcome of the chosen livelihood strategy, specifically, the level of income.

Based on its sources, income is classified into five types as provided earlier: income earned from (i) farming; (ii) agricultural-wage employment (iii) non-farm self-employment; (iv) non-farm wage employment; and (v) other non-farm incomes. The incomes in types (iii), (iv) and (v) are categorized as non-farm income.

Total household income is made up of income from farm and non-farm activities. Data for calculating crop income is collected at the plot level. In facilitating

the respondent's recall process, only the total payment received for paddy and the input expenditures of the last two crop harvests are collected, hence covering a one year period of rice growing activities. Households in the study area also receive income from oil palm crops. However, their crops are managed by private operators and they receive payments almost every month, which also indicate they do not incur any cost of production in the cultivation of oil palm.

The gross income from crop production is the sum of income from the production of paddy and oil palm. The net income from paddy cultivation was obtained by subtracting the sum of the cash expenses for land preparation, seeds, fertilizer, pesticides, harvesting, transport, and hired labor from the gross paddy income. The labor component consisted of wages paid in cash. The entire paddy produced was transported straight to the collection centers or rice mills from the paddy fields. None of the paddy was kept for home consumption. The rice for home consumption is bought from the local stores. Therefore, no values were imputed for home consumed rice. However, there are farmers who do save some paddy but it is intended for use as seeds for the next production season. Income from farm animals was not included in the study, as part of farm income, because none of the households has any livestock. In addition, the poultry that they do own is for home consumption and is not intended for income generation.

Agricultural-wage income is income earned from the provision of agricultural services to local farmers. Non-farm wage income is the total wage labor income from non-farm wage employment activities obtained mostly from salaried jobs. Non-farm self-employment income is income earned from household businesses in non-farm activities such as construction, food processing, transportation and other services. Finally, other non-farm income is total non-labor income from remittances, zakat, other transfers, pensions, and property rentals.

4.3.2 Measurement of independent variables

This study utilizes the asset categories and definition from the Sustainable Livelihood Framework (SLF), which are human, natural, physical, financial, and social capital, with the addition of locational capital. Given the available information from the household data set, a narrower definition of the broad asset categories from the SLF was used. There are two major categories of factors that determine a household's decision to participate in non-farm activities: (i) the factors that affect the relative return and risk of agricultural production; and (ii) the factors that determine the capacity to participate in non-farm activities (Reardon, et al., 1998). These two factors have been assumed to be determined by the household's asset endowments (De Janvry, et al., 2005). In the econometric models, various proxies are utilized to represent household capital endowment and the external factors which have been described in the conceptual framework. The following are the working definitions of each type of asset.

4.3.2.1 Human capital

Human capital is represented by household size (HSIZE) and household composition. Household size is measured as the number of household members. The adult equivalent measurement was used to take into account the relative needs of individuals of different age and sex within the household. The adult equivalent scale will enable the measurement of relative income required by households of different composition to maintain the same standard of living. The OECD adult equivalence scale was used to calculate the scale for this study. Using this scale, the first adult is counted as one, each additional adult counts as 0.7, and children are weighted by 0.5. Therefore, a family of two adults and three children are equivalent to 1 + 0.7 + (3 x 0.5) = 3.2 'equivalent adults' (UNDP & EPU, 2007).

Household size affects the ability to supply labor to the farm. In a large household, some members can remain in farming and others can choose to participate in off-farm employment which consists of agricultural-wage employment and non-farm wage employment. It is expected that the greater the number of family members, the greater the labor supply hence the higher the probability of a household participating in agricultural-wage and non-farm wage employments. This will result in a higher level and share of income from these two activities. Household composition includes age of household head (AGE), square of age (AGE^2), number of dependents (DEPENDENTS), number of working member (WLabor), and average education of working members (EDU).

The skill and experience of the head of household will have an effect on the level of household income. Due to the lack of this information the age of the household head (AGE) is used as an indirect proxy for experience instead. The probability of participation in non-farm employment will first increase and then decrease with age. Younger individuals are more likely to be involved in non-farm activities that are farther away from home while older household members are more likely to be involved in either on-farm work or local agricultural-wage or non-farm employment. Local non-farm work can be more easily combined with living in the village. Moreover, older individuals often have more experience and more contacts that are relevant for finding local agricultural-wage and non-farm employments. A positive relationship is expected between AGE and off-farm labor participation up to a certain age but beyond this age a negative relationship is expected. In order to capture this life-cycle effect on earnings, the square of the head of household age (AGE^2) is employed in the estimation.

Dependents include full-time housewives who are not involved in any income-generating activities, household members below 15 years old and those above 64 years old, except for those who are still involved in income-earning activities. The number of

dependents is expected to have a negative effect on household participation in agricultural-wage and non-farm employments. Therefore, a household with more dependents is expected to have a lower agricultural-wage and non-farm incomes, hence a lower total income. The more the number of dependents the lower will be the probability of choosing a livelihood strategy that includes non-farm employment especially if both parents are working.

Another household variable is the number of working member (WLabor) which is the number of working household members aged between 15 and 64 years old. The number of working members will influence the activity choice and are likely to lead to an expanded range of activities especially among households with limited opportunity of expanding their farm production due to small landholdings. This variable is expected to have a positive effect on the probability of choosing a diversified livelihood strategy. This would result in an increase in the level of income from all income generating activities and hence in total household income. The final human capital variable is the average years of formal education of working members (EDU). In general, households with higher education are usually more productive and have greater opportunities of finding non-farm employment. As a consequence, they will have a higher probability of choosing a livelihood strategy that combines farming with non-farm activities. Therefore, EDU is expected to have a positive effect on the level of household income as well as on the level and share of non-farm wage income.

4.3.2.2 Natural capital

Natural capital is made up of a household's total cultivated land size per adult equivalent (LandSize) which is owned and/or rented by the household and the percentage of land owned by a household (LandOwned). This consists of land that is allocated to the production of paddy and oil palm. Land ownership and land tenure are

important in the study areas. This is because land yields direct economic benefits as it is the main input to paddy production and as a source of income from rental. Holding other factors equal, a household with more cultivated land per adult equivalent is expected to have higher farm income and total household income. A household with a higher percentage of owned land will have a higher farm income because they are able to save on the cost of land rentals. These assets are expected to have a negative effect on the probability of choosing a diversified livelihood strategy. However, households with smaller land holdings and percentage of land owned will be more dependent on agricultural-wage and non-farm employments as a way of supplementing their farm income. Therefore, these assets are expected to have a positive effect on total income and farm income but a negative effect on off-farm income.

4.3.2.3 Physical capital

Physical capital includes non-land physical assets such as machinery, equipment, and transportation assets and livestock. In this study physical capital is measured by the value of machinery and equipment (i.e. agricultural implements) owned by farm households (EQUIP). These assets are those that contribute to a household's farm income and agricultural-wage income. Transportation assets are used for transporting agricultural inputs and outputs, hence the value of transportation assets are included in the value of equipment and machinery. None of the households in the sample owns any livestock for commercial purposes. Therefore, livestock is not included in the physical asset category. The utilization of machinery and equipment increases labor productivity by facilitating the adoption of improved production technologies and land productivity, hence enhancing agricultural operations (Jansen, et al., 2006). Furthermore, the ownership of agricultural implements enables a household to offer agricultural services, such as those related to land preparation, crop management, and transportation, to other farmers in the area hence increasing the probability of participating in agricultural-wage

employment. This would have a positive effect on the probability of choosing a livelihood strategy that combines farming and agricultural-wage employment. However, households with higher value of equipment will have a lower probability of participating in non-farm self-employment. The value of equipment owned is expected to have a positive effect on total household income, farm income, and agricultural-wage income but a negative effect on non-farm wage and non-farm self-employment income.

4.3.2.4 Financial capital

Financial capital includes pensions, remittances, zakat, other cash transfers, and rental income as well as having borrowing experience. A household's borrowing experience (CREDIT) is measured using a dummy variable which is "1" if the household has borrowed from any formal and informal sources in the last three years and "0" otherwise. CREDIT and the share of other non-farm income (ONFY_share) are expected to have a positive effect on the selection of a diversified livelihood strategy. It is expected that having borrowing experiences will have a positive effect on total household income and the level as well as the share of income from all other income sources. ONFY_share is also expected to have a positive effect on all income sources except agricultural-wage and non-farm wage incomes.

4.3.2.5 Social capital

The social capital variable is measured following the method by Grootaert et al. (2004). The approach has been used to generate quantitative data on various dimensions of social capital in the World Bank's Living Standards Measurement Survey or household income/expenditure survey in various developing countries. This method was also applied by Roslan et al. (2010) in studying the effect of social capital on the probability of a household being poor. There are six social capital components: (i) groups and networks, (ii) trust and solidarity, (iii) collective action and cooperation, (iv)

information and communication, (v) social cohesion and inclusion, and (vi) empowerment. A total of 14 questions were used to develop the construct representing social capital, as shown in Appendix A. The response was scaled from 1 ("strongly disagree") to 5 ("strongly agree"), respectively, and averaged across the number of responses for each of the constructs. The social capital index is constructed by averaging the scores from the responses from each construct and rescaling them from 0 to 100 where 100 refers to the highest possible value of the index. Social capital is expected to have a positive effect in the selection of a diversified livelihood strategy. Consequently, social capital is expected to have a positive effect on total household income as well as the level and share of income from all economic activities.

4.3.2.6 Locational capital

Locational capital is represented by the time taken to reach the nearest town (DTIME) and household location in either Panchang Bedena or Bagan Terap. Each respondent is asked to estimate the amount of time they need to get to the nearest town as proximity to towns will provide greater opportunities for the households to participate in non-farm employment. DTIME is expected to have a negative effect on the selection of a diversified livelihood strategy. It is also expected to have a negative effect on total household income as well as the level and share of income from non-farm income sources. Conversely, agricultural-wage employment is carried out within the village in which the household is located. Therefore, the effect of DTIME is likely to be not significant to agricultural-wage work.

In capturing the differences across communities, rural sub-district dummy variables for each of the study areas are included. These will capture any between-area variation in physical infrastructure, geographical and other variables that may affect households' diversification. The sub-district fixed effects may have considerable

explanatory power to diversification. Households that are located in Panchang Bedena in which the main town center is located as well as being closer to other nearby towns are expected to have a greater opportunity of participating in non-farm activities. Household location (AREA) is expected to have a positive effect on the probability of selecting a diversified livelihood strategy. This variable is expected to have a positive effect on all income sources except for agricultural-wage income. The variables that are used in the analyses throughout the study are shown in Table 4.1. Most of the continuous variables were measured in terms of percapita or per adult equivalent in order to reduce heteroscedasticity and to take into account the differences in household size since the sample includes large households with up to 10 members.

Table 4.1 Variables and measurements

Variables	Definition	Measurement
Dependent variables		
LS	Probability of choosing a livelihood strategy	Livelihood strategies: 1 = Highly specialized in farming; 2 = Farming and agricultural-wage employment; 3 = Specialization in non-farm employment; 4 = Farming and non-farm employment
THY	Total monthly household income	Log percapita income
FY	Level of monthly farm income	Log percapita income
AgWY	Level of monthly agricultural-wage income	Log percapita income
NFY	Level of monthly non-farm income	Log percapita income
NFWY	Level of monthly non-farm wage income	Log percapita income
NFSY	Level of monthly non-farm self-employment income	Log percapita income
FY_share	Share of farm income in total income	Percentage
AgWY_share	Share of agricultural-wage income in total income	Percentage
NFWY_share	Share of non-farm wage income in total income	Percentage
NFSY_share	Share of non-farm self-employment income in total income	Percentage

Table 4.1, continued

Variables	Definition	Measurement
Independent variables		
1. Human capital		
HSIZE	Number of household members living together in the same household regardless of family ties	Per adult equivalent
AGE	Age of the household head	Years
AGE^2	Age of the household head squared	Years
DEPENDENTS	Unemployed full-time housewives; children below 15 years old and those above 64 years old, except for income earners	Percapita
WLabor	Number of working household members (between 15 and 64 years old)	Percapita
EDU	Average education of working age household members	Years of completed schooling
2. Natural capital		
LandSize	Total cultivated area	Hectares per adult equivalent
LandOwned	Proportion of land owned	Percentage
Land size category: Land_cat1 Land_cat2 Land_cat3 Land_cat4	Size of cultivated land category: Land_cat1: (0.01 – 0.99 ha) Land_cat2: (1.0 – 1.99 ha) Land_cat3: (2.0 – 2.99 ha) Land_cat4: (> 3.0 ha)	Dummy variable (0 = "no", 1 = "yes")
3. Physical capital		
EQUIP	Estimated value of machinery and equipment owned by a household	Log per adult equivalent
4. Financial capital		
ONFY_share	Share of other non-farm income (rentals, remittances, pensions, and zakat) in total income	Percentage
CREDIT	Having borrowing experience	Dummy variable (0 = "no", 1 = "yes")
5. Social capital		
SC	Social capital is represented by six social capital components with 14 questions representing the construct	Index (log)
6. Locational capital		
DTIME	Travel time to the nearest town using the most common mode of transportation	Minutes
AREA	Household location in either Panchang Bedena or Bagan Terap	Dummy variable (0 = Other, 1 = Panchang Bedena)

4.4 Study area

Studies on livelihood strategies of rural households in various developing countries such as Latin America, Sub-Saharan Africa, China, India, Pakistan, and Bangladesh have been focused on rural households, especially the poor, who may or may not be involved in agriculture. Their income generating activities may or may not

have any government assistances or the production activities are being carried out in flood prone or drought-prone areas, hillside areas that are faced with soil erosion problems or in "secluded" areas which are far away from centers of economic activities.

The situation is different for this Malaysian study since the study area is a rice granary area that is fully equipped with irrigation facilities that has enabled a well-planned production system. In addition, paddy farmers are benefiting from various input subsidies, price supports and other production incentives. This has resulted in higher income from paddy cultivation, hence reducing the number of poor farm households in granary areas. Although all farmers in these areas earn substantial income from paddy production, they may not be full-time paddy farmers. The technological development in rice production and the situation of an aging farm population have increased the need for greater mechanization of agricultural services. This has resulted in the growth of agricultural-wage employment opportunities in the area. The mechanization of various tasks in rice production has greatly reduced the amount of labor time for rice production. Therefore, rural households are able to reallocate their labor time to other economic activities, either to agricultural-wage employment, non-farm employment, or a combination of both. This would also imply that paddy farmers in the area have experienced economies of scope through the allocation of their assets to various income generating activities.

The development of granary areas has also been coupled with the development of rural towns which have provided greater non-farm employment opportunities to rural households in the area. As an example, the development of the town of Sungai Besar in the study area has provided non-farm employment opportunities to local households. The development in nearby rural towns is also a source of non-farm employment for

these households. Furthermore, most of the farmers in Sungai Besar are part-time farmers.

Given the above scenario the chosen study areas are Bagan Terap and Panchang Bedena which are situated in the Northwest Selangor Integrated Agricultural Development Area (IADA). There are altogether eight subdivisions in this IADA. In addition to Bagan Terap and Panchang Bedena, the other six subdivisions are Sungai Nipah, Pasir Panjang, Sungai Leman, Sekinchan, Sungai Burong and Sawah Sempadan, which are shown in Figure 4.2.

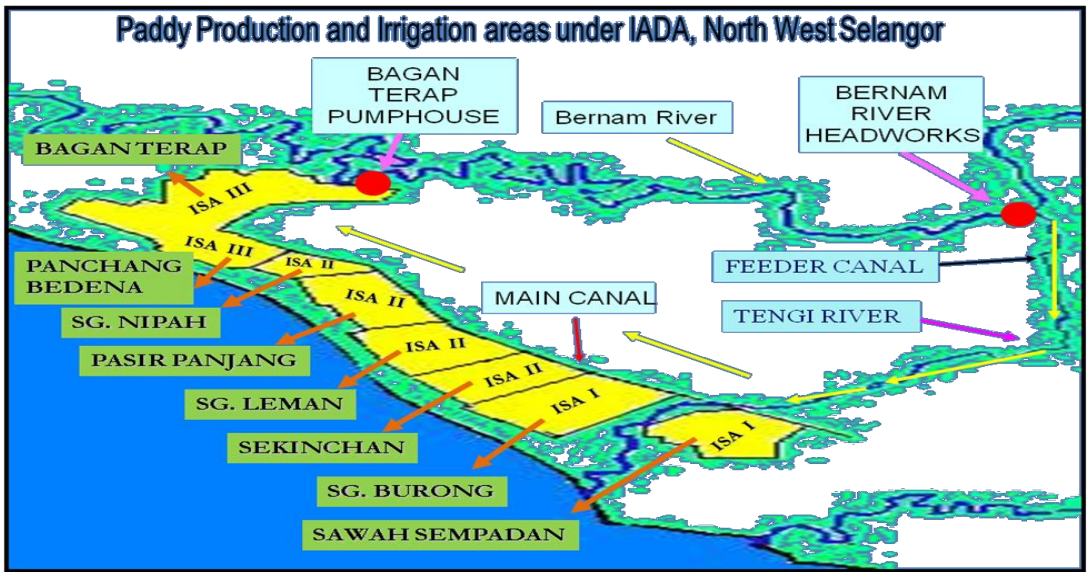


Figure 4.2: Granary areas in Northwest Selangor IADA

Source: IADA 2009

The two study areas are located at the tail-end of the irrigation system, hence are the last areas to receive water from the irrigation canals. Shand (1987) as well as Hussain et al. (2004) have also observed that areas at the tail-end of an irrigation system will experience lower yield. Part of the reason for the lower productivity was the lower quality of irrigation water. Despite the availability of water, farmers in these two areas are more vulnerable to unfavorable weather conditions. There might not be sufficient water especially during off-season as water is first released in Sawah Sempadan. This

may affect paddy yield in these areas compared to other areas. In terms of land area for paddy cultivation, Sungai Burong has the largest percentage of paddy cultivated land (17.8 percent) followed by Panchang Bedena (17.4 percent) and Bagan Terap (13 percent) as shown by Table 4.2. The total number of farmers in Bagan Terap is 2,111 farmers while in Panchang Bedena there are 2,508 farmers, who are registered with the Sungai Besar Area Farmer Association. As of 2010, about 2,350 farmers are involved in paddy mini estate projects, which cover an area of 3,200 hectares.

Table 4.2: Land area of Northwest Selangor IADA

	Paddy Land Area	
Area	**Hectares**	**%**
Bagan Terap	2,365	13.0
Panchang Bedena	3,174	17.4
Pasir Panjang	1,617	8.9
Sawah Sempadan	2,304	12.6
Sekinchan	1,863	10.2
Sg Leman	1,936	10.6
Sg Nipah	1,734	9.5
Sg. Burong	3,240	17.8
Total area	18,233	

Source: Md. Mahmudul (2009)

The study areas are homogenous as they are characterized by mixed but still primarily agricultural economy that depend on the production of paddy - a conventional, heavily subsidized, agricultural commodity which is produced on the same type of soil. However, the achievement of different yields on similar size of cultivated areas reflects variability of soil fertility within smallholder farms. These variations may be due to resource limitations which affect farmers' planting decisions, in particular, those relating to crop management.

4.5 Sampling

One of the basic features of the sample is its location in a major rice producing area that is situated in Selangor, which is one of the most developed states in Malaysia.

Households in this area are producing paddy for commercial purposes rather than for subsistence or home consumption. The average income of households in the areas is about RM2,940 per month, which is higher than the national average of RM2,545 per month for rural households.

The population of paddy farmers in the study areas, as provided by the Area Farmer Association, during the period of study, is 4,637 farmers, with 2,526 farmers in Panchang Bedena and 2,111 farmers in Bagan Terap. It is assumed that these farmers are homogenous as each household is involved in paddy cultivation hence each household has income from rice cultivation as one of their sources of income. These rice farmers have been selected for the study because they are among rice farmers that are located in an IADA that has a paddy production system that is heavily mechanized. This has greatly reduced the number of labor hours required in paddy cultivation. Hence, allowing farmers to reallocate their family labor to agricultural-wage and non-farm employment.

Based on the method of determining sample size by Sekaran (2006), a total sample of 359 farm households was determined for the study. The sample size for Panchang Bedena was 195 farm households while for Bagan Terap the sample size was 164 farm households. A multistage random sample was constructed by taking a series of simple random samples in stages. A random sample of villages was taken from within each of the study areas in the first stage. Then, in the second stage, a random sample of production blocks was taken from within each of the villages chosen in the first stage. Finally, for the third stage, within each production block a random sample of paddy farmers were then selected. The random selection of these farm households was determined proportionately by the ratio of population in each area to total population. Therefore, the sample size for each area was determined by multiplying 0.077 with the total population in each area. In order to obtain the sample size in each production block

in each village, the same procedure as above is followed by first calculating the ratio of sample size to total number of farmers in the selected blocks. The number of sample for each production block was then determined by multiplying the sample weights of 0.641 (for Panchang Bedena) and 0.484 (for Bagan Terap) with the total population in each selected block. The total population and sample size for each area are shown in Table 4.3.

Table 4.3: Population and sample distribution for Panchang Bedena and Bagan Terap

Panchang Bedena				**Bagan Terap**			
Village	**Block**	**No. of farmers**	**Sample size**	**Village**	**Block**	**No. of farmers**	**Sample size**
	A04	31	20		E11	39	19
Sg. Haji Dorani	A06	40	26	Parit 6 Timur	E12	43	21
	B05	42	27		E14	45	22
Parit 1 Timur	B06	49	31	Parit 7 Timur	E16	45	22
	C12	35	22		F2	59	28
Parit 2 Barat	C13	31	20	Parit 10 Timur	F5	41	20
	D11	53	34		F16	35	17
Parit 11 Barat	D12	23	15	Parit 13 Sg. Panjang	F22	32	15
	Total	**304**	**195**		**Total**	**339**	**164**

4.6 Data collection

The survey was designed with a focus on the income generating activities of rural households, both in the farm and non-farm sectors, as well as their asset endowments. The questionnaire for data collection, as shown in Appendix B, was developed based on an adaptation of the questionnaire from the Living Standard Measurement Survey (LSMS) of the World Bank (Grosh & Glewwe, 2000). The adaptation to the LSMS questionnaire was made by taking into consideration the study objectives and the context within which the study was carried out. The questionnaire design was developed based on the discussions with the thesis supervisor and an officer from the Area Farmer Association of Sungai Besar. There are six sections in the questionnaire, with each section representing data on each asset category – human, natural, physical, financial, social, as well as locational capital. Cost of production data

was also collected in order to calculate the net farm income. Farm income is included in the study as total household income is made up of farm income and non-farm income.

Other information gathered through the questionnaire includes those related to non-farm employment such as types and level of income from various sources, including pensions, remittances, zakat, other transfers, and rentals. Since a household usually has more than one economically active member, hence, household income sources are more diversified than individual income sources (Stifel, 2010). Therefore, employment information from individual household members was collected. The inclusion of individual household members is also important because a family member's decision to participate in the non-farm labor market will have an effect on the other members' non-farm participation decisions.

A pre-testing of the questionnaire was carried out in April, 2011. Pre-testing a questionnaire is important to ensure a well-functioning survey instrument, well-understood questions, to reduce the number of unanswered questions in order to identify questions that provide same responses from respondents, to determine the adequacy of the instructions to respondents and to determine the smooth flow of the questions (Bryman, 2004). The original questionnaire was reduced based on the supervisor's suggestions before the pre-testing which was carried out with 30 respondents from the study area, with 15 respondents each from Panchang Bedena and Bagan Terap. The respondents were selected from two production blocks that were not part of the sample. Based on the data collected, a few changes were made to the questionnaire especially in the way income and input cost data are collected. Tables were used instead of individual questions. Other questions involving household assets, in particular, landholding size and ownership were also simplified into table form. The field survey was carried out from May to July, 2011.

4.7 Data cleaning and entry

Data cleaning was first carried out before data entry. This is to reduce any discrepancies in the data especially those relating to production costs and values of assets as it would affect the relationship among variables. In addition, it would also result in the inaccuracy of the regression results. Data cleaning was also performed after data entry using the PASW Statistics Base 18 and Eviews Version 7. Data cleaning involve examining the data for missing values, inconsistencies, and extreme values or outliers. There were very few missing data, which was mainly caused by data entry errors. In detecting outliers, the univariate method was used, which involves converting the data values into standardized scores. For a sample size of greater than 80 observations, the outliers are defined as cases with standard scores of between ±4 (Hair, Black, Babin, Anderson, & Tatham, 2006). Using this method of detecting outliers, no outliers were discovered as the standardized scores for each variable was less than ±4.

4.8 Data Analysis

This section is an explanation of the methods used in analyzing the data for the study. The discussion in this section begins with the descriptive analyses of household income and assets. This is followed by a description of the clustering procedure for the livelihood strategies using cluster analysis. A multinomial logit regression is then used to determine the probability of a household choosing a particular livelihood strategy by identifying the asset variables that are significant to the selection of each strategy. The last section is an explanation for the calculation and decomposition of the Gini coefficient.

4.8.1 Test of normality

In determining the statistical method to be applied in an analysis, the data has to be classified as parametric or nonparametric data. Parametric statistics are based on certain assumptions about the nature of a population. Two of the most common assumptions are that the data are interval or ratio scale and that the data is normally distributed (Leedy & Ormrod, 2005). In order to apply parametric tests, a few assumptions are required: the observations are randomly selected from a normally distributed population; the population must have equal variance and data is measured using at least an interval scale (Cooper & Schindler, 2006). In determining whether the above assumptions have been met, the data is tested for normality of distribution and equality of variance.

Table 4.4: One-Sample Kolmogorov-Smirnov (K-S) Test

Variable	Mean	Kolmogorov-Smirnov Z	Asymp. Sig. (2 tailed)
Age of household head (years) (AGE)	52.2	0.930	0.352
Household size / adult equivalent (HSIZE)	2.9	1.824	0.307
Number of working members percapita (WLabor)	3.0	3.737	0.213
Number of dependents percapita (DEPENDENTS)	1.1	4.464	0.193
Average education of working members (EDU)	9.5	6.055	0.124
Size of cultivated area (ha / adult equivalent) (LandSize)	2.1	3.065	0.257
Percentage of land owned (%) (LandOwned)	65.4	5.478	0.152
Value of equipment owned (log / adult equivalent) (EQUIP)	2.6	5.278	0.181
Share of other non-farm income (%) (ONFY_share)	1.3	9.126	0.073
Social capital index (log) (SC)	1.94	2.766	0.291
Time to town (minutes) (DTIME)	24.6	1.644	0.328

The normality of distribution is determined by examining the skewness and kurtosis values of each interval scale variables. The test of normality was performed using the one-sample Kolmogorov-Smirnov (K-S) test. According to the K-S test, if the significance level of K-S *z statistic* for each variable is greater than 0.05 then normality

is assumed (George & Mallery, 2003). The results of the K-S test are presented in Table 4.4 and it shows that the K-S *z statistic* for all of the variables have a significance value of greater than 0.05. This means that the data for the variables are normally distributed. Therefore, the parametric method is used in testing the hypotheses.

4.8.2 Reliability of the survey instrument

Reliability refers to the internal consistency of the instrument used in a study. It measures the consistency between several measures of a variable (Hair, et al., 2006). Internal consistency is the measure of reliability that is used to determine the reliability among the items in a summated scale. This is relevant for the social capital variable as it is a form of construct made up of various items. Internal consistency is important because individual items of a scale should be measuring the same construct and hence should be highly inter-correlated. The Cronbach's Alpha is the measure of internal consistency that is used to determine the internal consistency of the social capital construct. It has a value of between zero and one. The closer is the value to one, the greater the reliability of the instrument used. In general, the minimum value of Cronbach's Alpha is 0.7 (Hair, et al., 2006). If the value is lower than 0.7 the internal consistency of the variable is questionable. Therefore, following Hair et al. (2006), a Cronbach's Alpha value of greater than 0.7 will be used in this study. A Cronbach's Alpha value of 0.816 was obtained for the social capital variable construct, as shown in Appendix A. This indicates that all the items in the construct for the social capital variable are reliable.

4.8.3 Descriptive analysis

Descriptive analyses of the information gathered were performed in order to examine the characteristics of the sample by area and livelihood clusters, in terms of household assets and outcome, in particular, income share and income level.

4.8.4 Analysis of livelihood strategies

In the analyses of livelihood strategies, households are classified by livelihood clusters as this will enable greater understanding of the relationship between diversification and household income. The livelihood strategy chosen by a household is an indication of what a household considers as its best option given individual preferences and constraints. This implies that it would not be rational to rank livelihood strategies. This study distinguishes four strategies:

(i) Highly specialized in farming strategy which include households whose main source of income is from crop production;

(ii) Farming and agricultural-wage employment strategy which include households whose total income is mainly from the combination of farming and agricultural-wage employment;

(iii) Specialization in non-farm employment which include households whose main source of income is from non-farm employment; and

(iv) Farming and non-farm employment which include households whose total income is from the combination of income from farming and non-farm employment.

4.8.4.1. Cluster analysis

A livelihood strategy shows how assets are allocated to activities in order to achieve the highest level of returns to the household. This study determines the livelihood strategies adopted by farm households and the livelihood concept was quantified by generating a household typology using cluster analysis.

Cluster analysis has been applied in the areas of farm typologies (Daskalopoulou & Petrou, 2002; Emtage, 2004; Orr & Jere, 1999), and farming systems (Bernhardt, Allen, & Helmers, 1996). In general, these studies involve the classification of farm

households based on their socio-economic characteristics. A more specific application of cluster analysis in the study of livelihood strategies has been utilized by Stifel (2010) for Madagascar, Brown et al. (2008), Ilyama et al. (2006) for Kenya, Petrovici and Gorton (2005) for Romania and Douorin, Litchfield, & Sakrates-Wheeler (2001) for Kosovo.

Cluster analysis is a statistical data reduction method that is used to summarize a large number of observations by grouping them into smaller, manageable distinct clusters. Clustering is performed based on the similarity of pre-determined characteristics (Hair, et al., 2006). The elements of each cluster should be as similar as possible (high internal homogeneity), while the clusters should differ among each other as much as possible (external heterogeneity). The underlying classification rule is to maximize the similarity of the objects (by minimizing their distances to each other) using *a priori* selected cluster variables. In this study the cluster variables used are share of farm income, share of agricultural-wage income and the share of non-farm income in total household income.

In performing the cluster analysis, there are two important requirements that must be fulfilled: representativeness of the sample and multicollinearity among cluster variables. This is because cluster analysis is a quantification method of structural characteristics of a particular set of observation; thus it does not have strong statistical foundations. The normality, linearity and homoscedasticity requirements of other techniques are not as important for cluster analysis (Hair, et al., 2006). In terms of the sample size for the study (359 cases) it is sufficiently large in terms of cases-per-variable ratio. The availability of about 20 cases per variable meets the minimum requirement of 20 cases per variable. The variance inflation factor (VIF) for all the cluster variables are all less than 3.0, which means that there is no problem of multicollinearity among the cluster variables.

The first step in the cluster analysis is an agglomerative hierarchical clustering which is used to determine the number of natural clusters that exist in the data. The Ward's linkage method was used as the method for linking clusters and squared Euclidean distance as the measure of distance between clusters. Because the variables had different units of measurement they were standardized to *Z* scores with a mean of 1 and a standard deviation of 0.

A dendrogram, which is based on the hierarchical clustering procedure, was used to visually inspect groups within the data. The dendrogram indicated the presence of four primary groups or clusters. The agglomerative hierarchical cluster analysis has efficiently grouped households and helps to determine the number of clusters to consider. However, hierarchical clustering can lead to misclassification of observations at the boundaries between clusters (Hair, et al., 2006). Therefore, a non-hierarchical cluster analysis, which is the *k*-means cluster analysis, is used in the next step of the cluster analysis. The number of clusters and the means of each cluster variable in these clusters are used as starting centers for the *k*-means analysis. Observations were then assigned to clusters that they are "closest" to. Once the sampled households have been clustered into the respective livelihood clusters, their livelihood choice is explained based on a set of predetermined asset-based variables that include natural, human, physical, financial, and social capital as well as locational capital.

In addition to cluster analysis, a one-way analysis of variance test (ANOVA) was also performed. The test enables the determination of the significance of differences in the means of percapita income, which is the outcome of a livelihood strategy, between clusters. In observing the differences in the mean of cluster variables and household assets among livelihood clusters, there is also the need to determine whether the differences are real or by chance. In comparing the means of these variables among the four clusters, the ANOVA test is also performed. This is to determine

whether the differences in the mean of the variables across livelihood clusters are statistically significant.

Once the livelihood clusters are identified, a multinomial logit regression was performed using selected household asset variables. The results from the multinomial logit model will allow the estimation of the probability that a household will adopt a particular livelihood strategy, given its asset base and other factors. Through the use of multinomial logit regression, the extent to which there exist barriers to choosing high return livelihood strategies can also be assessed.

4.8.5 Analysis of income distribution

The distributional consequences of non-farm income are analyzed for the whole sample and each livelihood cluster. The first step in analyzing the distribution of income is to estimate the income equations. This is followed by the (i) determination of the Gini coefficient; (ii) decomposition of the Gini coefficient by income source; and (iii) decomposition of the Gini coefficient by household assets based on the coefficients estimated from the income equations. The following sections are explanations of the above steps.

4.8.5.1 Estimation of income equations

Separate income functions for income levels and income shares were estimated for each income source. The income shares reflect the importance of activities at a household level. Ordinary Least Square (OLS) regressions were used to estimate the equations for total household income and farm income as well as the share of farm income in total household income. This is because these two income categories are reported for all respondents. OLS estimators are best unbiased estimators under specific assumptions and the violation of these assumptions can lead to biased estimates (Greene, 2008). The biasness to the OLS results is commonly caused by

heteroscedasticity and multicollinearity (Gujarati, 2009). The semi-log functional form was used because it enables the inequality decomposition and it eliminates the skewness of the income variable (Naschold, 2009).

Heteroscedasticity is a situation where the variance of the error term differs across observations. It may lead to unbiased estimates but the standard errors and the t-statistics are no longer valid. The White's general test for heteroscedasticity is applied using EViews 7. Using the log of percapita income and percapita farm income in the OLS regression, the hypothesis of homoscedasticity was rejected at the 5 percent significance level. This indicates heteroscedasticity in the models and the White's approach (with cross terms) was used to minimize the heteroscedasticity bias.

Another possible problem associated with OLS estimates is multicollinearity among independent variables, which indicates the existence of high correlation between the independent variables. If there is multicollinearity, the OLS estimates will have large variances and co-variances and the models will be sensitive to small changes in the data. The Variance Inflation Factor (VIF) is used as an indicator for the presence of multicollinearity. The VIF measures the variance in the regressors that cannot be accounted for by other independent variables. The values of the VIF in the models show no values greater than the cut-off value of 10 (Gujarati, 2009) as the VIF values are all below 3. This indicates that multicollinearity is not a problem in the models.

Empirical studies on the determinants of livelihood diversification have commonly applied the censored Tobit regression method in estimating non-farm income equations (Abdul Malek & Usami, 2009; Adams, 2002; De Janvry & Sadoulet, 2001; Woldenhanna & Oskam, 2001). This is because some households have zero income shares from some income sources due to non participation, hence indicating that income variables have some censored data. The Tobit model, however, has been criticized by

Deaton (1997) due to the inconsistencies caused by the heteroscedasticity bias that produces estimates that are biased upward. Therefore, corrective actions were taken during the specifications of equations and coefficients, in order to minimize the heteroscedasticity bias. The Huber-White heteroscedasticity-robust estimator has been used in order to produce valid standard errors and t-statistics. An alternative method is to use two-stage models as suggested by Heckman (1979). However, due to the absence of a participation equation, which is required in the first stage of the Heckman procedure, the Tobit model was chosen as the most appropriate method.

In order to analyze the determinants of non-farm income diversification, each of the income equations has the same explanatory variables. This will enable the identification of significant factors affecting each of the identified non-farm income sources.

4.8.5.2 Calculation of Gini coefficient

In identifying the impact of non-farm income on inequality the observed household income distribution is compared to an income distribution without non-farm incomes. The Gini coefficient for overall income with non-farm income is compared against the Gini coefficient of overall income without non-farm income to determine the effect of non-farm income on the distribution of household income.

The calculation of the overall Gini coefficient is made using the method proposed by Pyatt et al. (1980), Lerman and Yitzhaki (1985), and employed by Stark et al. (1986), Liebbrandt et al. (2000), Kung and Li (2001), Adams (2002), Huang et al. (2005), Lay et al. (2008) and Omilola (2009). The Gini coefficient for overall income (G), which has a value that ranges from zero to one, is calculated using the following formula:

$$G = \frac{(2\text{Cov}\,[Y, F(Y)])}{\mu}$$

where Y is total household income, F(Y) is the cumulative distribution of total household income in the sample, that is, the rank of Y in the sample divided by the total number of observations, and μ is the mean income of the sample households.

4.8.5.3 Inequality decomposition by income source

Inequality decomposition can be made on the basis of population group or income source. Since diversification in the data for this study is based on income sources, the decomposition by income sources is performed. Total household income is made up of income from different sources - farm, agricultural-wage, non-farm wage, and non-farm self-employment incomes - which have their own contribution to the level of overall inequality. Therefore, total inequality can be expressed as the sum of each income factor contribution (Adams, 2002).

In examining the impact of non-farm income on household income distribution, some studies have used the approach suggested by Shorrocks (1983). Following this approach the source Gini and pseudo-Gini coefficients for household income and for each of the income components are calculated. The source Gini coefficients are calculated based on all households, for which a particular income component is available, while pseudo-Gini coefficients are calculated for the full sample (Abdul Malek & Usami, 2009; De Janvry & Sadoulet, 2001; Escobal, 2001). According to Shorrocks (1983), the Gini coefficients of household income are decomposed into its factor components. The decomposition rule considers the relative importance of each income component in terms of its share in total household income, the pattern of inequality of each income component (measured by the pseudo-Gini coefficient) and the correlation between each income component and household income.

Decomposing the Gini coefficient provides two ways of measuring the contribution of any income source to overall income inequality. First, it enables the determination of the contribution of each income source to total income inequality. Second, it will also enable the determination of the effect of the inequality of an income source in increasing or decreasing overall income inequality. Stark et al. (1986) in studying of the effect of remittance on inequality utilized the Gini coefficient that captures the contribution to inequality of each income source. Using the notation of Stark et al. (1986), the Gini coefficient for total income, *G* can be denoted as:

$$G = \sum_{k=1}^{K} R_k G_k S_k \quad (1)$$

where $R_k G_k S_k$ is the contribution of income source *k* to overall income inequality; S_k represents the share of income from source *k* in total income (i.e. $S_k = \mu_k/\mu$); G_k represents the Gini coefficient of the inequality in the distribution of income source *k*; and R_k stands for the Gini correlation between income from source *k* and total income. This also means that the contribution of each individual income source *k* to the overall income inequality can also be decomposed into three components, which are R_k, G_k, and S_k. The smaller the product of these three components the lower will be the contribution of income from source *k* to total income inequality, and vice-versa. According to Adams (2002) and Huang et al. (2005), R_k can be calculated as follows:

$$R_k = \frac{\text{cov}[Y_k, F(Y)]}{\text{cov}[Y_k, F(Y_k)]} \quad (2)$$

where $F(Y)$ and $F(Y_k)$ represent the cumulative distributions of total income and the income from source *k*, respectively.

Notably, the value of S_k is always positive and less than 1; the value of G_k is always positive and may be greater than 1 when the values for one or more of the

income sources are negative; and the value of R_k can fall between -1 and +1. R_k shows the strength of the relationship between the income from source *k* and total income, and reflects the degree to which they are related. When $R_k = +1$, there is a perfect positive relationship between income source *k* and total income.

In determining whether an income source decreases or increases overall income inequality, the following equation is used (Adams, 2002):

$$(3) \qquad g_k = R_k (G_k / G)$$

where g_k represents the relative concentration coefficient of income source *k* in the total income inequality. If the value of g_k is greater than 1 this shows that income source *k* increases total inequality. On the contrary, if the value of g_k is less than 1 then income source *k* decreases overall income inequality.

In analyzing the sensitivity of a marginal change of an income source on overall inequality, a sensitivity analysis following the method by Stark et al. (1986) is applied. Assuming there is an exogenous increase in income from source *k*, by factor σ_k which is $y_{ik}(\sigma_k) = (1 + \sigma_k)y_{ik}$ for i =1,.., n. Therefore, the distribution of income from source *k* is given by:

$$Y = ((1 + \sigma_k)y_{1k} ,\ldots, (1 + \sigma_k)y_{nk})$$

The derivative of the Gini coefficient with respect to a change in income source *k* is:

$$(4) \qquad \frac{\partial G}{\partial \sigma_k} = S_k (R_k G_k - G)$$

A negative value for $\partial G/\partial \sigma_k$ indicates that a marginal increase in income component *k* will reduce the level of income inequality. This will be achieved if the income from component *k* has a negative or zero correlation with total income ($-1 \leq R_k \leq 0$); or if the income from source *k* is positively correlated with total income ($R_k > 0$) and $R_k G_k < G$.

A marginal increase in income source *k* will worsen income inequality if the inequality in the distribution of income from source *k* is higher than total income inequality ($G_k > G$). However, this condition alone is not sufficient for income source *k* to worsen total income distribution because the sign of $\partial G/\partial \sigma_k$ will still be influenced by the strength of the Gini correlation between income source *k* and total income (Lerman & Yitzhaki, 1985; Stark, et al., 1986). Dividing equation (4) by G will provide the following equation:

$$(5) \qquad \frac{\partial G}{\partial \sigma_k}\left[\frac{1}{G}\right] = \frac{S_k R_k G_k}{G} - S_k$$

Equation (5) represents the marginal effect (measured in percentage change in G) of a percentage change in income source *k*. It is also known as the elasticity of inequality. Positive inequality elasticity implies that a uniform increase in the price of paddy, for example, will increase the level of inequality, vice versa.

The Lorenz curve, which plots the cumulative income share and the cumulative distribution of household income, is used to illustrate the income distribution. The further the distance of the actual Lorenz curve from the straight line of equal distribution, the more uneven is the income distribution.

4.8.5.4 Inequality decomposition by household assets

The above techniques are widely used in studies on the determinants of inequality. The analysis in these inequality decomposition studies is statistical in nature, which excludes a range of variables which can be influenced by policy. As an example, the decomposition by income source can help to identify how much of total income inequality is caused by farm income and non-farm income. However, it cannot assess how household assets such as human capital, land ownership, or location affect income

inequality. Similarly, decomposition by livelihood clusters can show how income varies between certain groups, but it does not indicate why it varies.

A small but growing number of studies has been undertaken to close this gap using a regression-based technique developed and refined by Fields (2002), Ravallion and Chen (1999), and Adams (2002). This technique combines income regression analysis with the Shorrocks's (1982) decomposition by income source, where the sources of income in the second stage decomposition analysis are determined by the first stage income regression. This technique will enable the explanation of inequality by any factor that is included in an income regression.

The regression-based approach to inequality decompositions by Fields (2002) was applied in this study in order to examine how much inequality at one point in time can be explained by income determinants, which consists of household assets. This decomposition technique enables a more detailed analysis of the source of income inequality compared to the traditional inequality decompositions by income source or by subgroup. The traditional inequality decompositions are basically descriptive in nature as it enables the identification of the types of incomes or sub-groups that explains the level of inequality. However, the analysis using the traditional method only provide limited information and does not take into account household asset endowments because of their statistical design. Therefore, the conclusions regarding the level of income inequality and the approach to be used in dealing with the inequality tend to be vague (Fields, 2002; Morduch & Sicular, 2002; Naschold, 2009; Wan & Zhou, 2005).

The regression-based inequality decomposition proposed by Fields (2002) is basically the assessment of the effect of an income determinant on overall inequality at a point in time. This section explains the steps in this decomposition technique. The first step is to find the determinants of household income, which is achieved by regressing

income on a range of household assets, in particular, the asset variables that have been used previously in the multinomial logistic regression. The income generating function can be written as follows:

$$\ln y = \propto + X\beta + \varepsilon \quad (6)$$

Where *ln y* is the N-vector of the logarithm of household income percapita, $\propto$ is the intercept, X is the N x K matrix of k household assets, and ε is the normally distributed error term. A linear model with a semi-logarithmic income equation is estimated for total income and farm income by OLS while for other income sources by Tobit regression, with the selected household assets as regressors. Some of the asset variables may be considered as endogenous, such as household size which is affected by migration and education which may be affected by a household's decision, especially in the long-run. However, since the period of study is only for one year, it is appropriate to treat all household asset variables as exogenous. The coefficient estimates from the regressions are then multiplied by the respective household assets. Each of the products can be regarded as the share of income source from each variable.

The second step is to identify the determinants of the level of income inequality. This is done by using the share of income source from each variable, which was calculated in step one, as inputs into a Shorrocks-type (1982) inequality decomposition by income source (Fields, 2002). This decomposition provides 'relative factor inequality weight' for each variable in the income regression. Each weight will measure a variable's percentage contribution to the level of overall inequality. The relative factor inequality weight of a variable, x_k, is given by the following equation.

$$s_k = \hat{\beta}_k \mathrm{cov}(x_k, y) \div \sigma_y^2 \quad (7)$$

The relative factor inequality weight for the error term of the regression (ε) indicates how much of the overall level of inequality cannot be explained by the

available household variables. Therefore, the inequality decomposition is only as good as the explanatory power of the income regression (R^2). The calculation of the relative factor inequality weight for the error term of the regression is given by:

$$(8) \quad s_\varepsilon = \text{cov}(\varepsilon, y) \div \sigma_y^2 = 1 - R^2 \text{ and } \sum_{k=1}^{K} s_k = R^2$$

To measure the proportion of explained inequality that is due to a specific variable (*k*) the percentage contribution or 'p weights', p_k, was calculated. Basically, p_k is the factor inequality weight divided by the R squared of the regression (Fields, 2002):

$$(9) \quad p_k = s_k / R^2$$

Using the regression-based decomposition technique as it is more flexible and can be more insightful for policy purposes. The strengths of the technique include (i) inequality can be decomposed into any variables in an income regression; (ii) it is easier to combine the relative factor inequality weights of a set of variables into a single factor such as combining age, household size and education into a single human capital variable; (iii) the subgroup and source inequality decomposition can be combined in one analysis; (iv) the constant in the regression does not affect inequality because the relative factor inequality of the constant is zero by definition; and (v) relative factor inequality weights are independent of the inequality measure being used (Fields, 2002).

4.9 Summary

This chapter presented the methodology used to answer the research questions of this study. Data was collected through a standardized, formal questionnaire from 359 randomly selected households. The hierarchical and non-hierarchical cluster analysis is applied to the sample in order to determine the livelihood clusters. The t-test and the Analysis of Variance (ANOVA) are used to test for statistical significant differences among groups in the descriptive analysis. The determinants of total household income

and farm income are estimated using OLS while the equation for other income sources are estimated using Tobit regression. A multinomial logit regression is used to determine the significant factors affecting household selection of a particular livelihood strategy. The chapter ends with a description of the method for determining the level of income inequality and the method for decomposing income inequality by income sources and household assets. The next two chapters present the findings of various analyses of household incomes and activities based on the identified livelihood clusters as well as the distribution of income.

CHAPTER 5

FINDINGS FROM CLUSTER ANALYSIS

5.1 Introduction

This chapter presents the results of the descriptive analysis of household characteristics, which is mainly based on their asset endowments, income and activities as well as the findings from the MNL regression of livelihood strategy selection and the analysis of income distribution. The chapter starts with a descriptive analysis of the sample, followed by a description of livelihood strategies adopted by households in the Sungai Besar granary area with the presentation of summary statistics for households adopting each of the identified livelihood strategies. The final section presents the determinants of households' selection of a specific livelihood strategy obtained from the multinomial logistic model.

5.2 Participation in non-farm activities

As can be expected of a rural area, a majority of the households (71 percent) obtain their income from a diversified income activity while only 29 percent of the households (103 households) had one income generating activity, which was farming. In general households in the study area earn about RM2,940 per month with farm income as the major component, constituting up to 67 percent of mean total household income (Table 5.1). There are basically three general categories of employment – farming, agricultural-wage employment, and non-farm employment. Farming includes the production of crops such as paddy and oil palm, therefore, income from crop production is made up of income from paddy cultivation and oil palm receipts. Since the study area is a rice granary area, all households earn income from paddy production. In general, the mean income from this agricultural activity is about RM1,662 per month,

which was about 57 percent of mean household income. Another source of crop income is the monthly receipt of income from oil palm cultivation. This source of income was received without any household involvement in the cultivation of oil palm hence they do not incur any input costs. Therefore, the income received from their oil palm plots are considered as net income from oil palm. The mean oil palm income accounts for 11 percent of mean household income. Out of the 359 sampled households, only 158 households or 44 percent had this category of crop income.

Local agricultural-wage employment involves household participation in activities that were related to paddy cultivation such as land preparation, crop harvesting, and transportation, rice transplanting, and other paddy related agricultural services. With the continued predominance of agriculture in these communities, it was inconceivable just how large the market for agricultural-wage laborers could possibly be. Out of the 359 surveyed households, only 130 households (36 percent) had at least one member participating in agricultural-wage employment, as shown in Table 5.1. In Panchang Bedena the participation rate in agricultural-wage employment was as high as 33 percent, while in Bagan Terap, the participation rate was about 40 percent.

Local non-farm employment comprises of employment in management or clerical work, public service sector through employment in various government agencies, sales and services, food processing, and construction work. These categories of non-farm employment provide earned income to households. Overall, about 74 percent of households in the sample receive some form of non-farm income. The main contributors to total non-farm income earned by households are the children who contributed up to 54 per cent, followed by the head of households with 38 per cent and their spouses with 8 per cent. In Panchang Bedena the participation rate in non-farm employment was about 88 percent, which was much higher compared to Bagan Terap, with a participation rate of up to 57 percent. Within the non-farm employment category,

private sector employment in management and clerical work had the highest number of participation, followed by employment in the public sector, in both of the study areas. Overall, household participation was higher in nonfarm activities compared to agricultural-wage employment in both study areas. Lower household participation in agricultural-wage activities was also observed in income diversification studies in Latin America and Africa (Reardon, 1997; Reardon, et al., 2001).

Table 5.1: Income by activity

Income Source	Panchang Bedena (N = 195)		Bagan Terap (N = 164)		Total (Sg Besar) (N = 359)	
	RM / Number	%	RM / Number	%	RM / Number	%
Total household income						
Mean income for all households	2537	100	2947	100	2940	100
Farm income						
Mean income for all households	1796	71	2191	74	1976	67
Number of participating households	195	100	164	100	359	100
Paddy income						
Mean income for all households	1512	60	1840	62	1662	57
Number of participating households	195	100	164	100	359	100
Oil Palm receipts						
Mean income for all households	284	11	351	12	315	11
Number of income recipients	86	44	72	44	158	44
Agricultural-wage income						
Mean income for all households	147	6	274	9	205	7
Number of participating households	64	33	66	40	130	36
Non-farm income						
Mean income for all households	505	20	807	27	643	22
Number of participating households	172	88	94	57	266	74
Management						
Mean income for all households	156	6	199	7	176	6
Number of participating households	28	14	30	18	58	16
Government employees						
Mean income for all households	196	8	216	7	205	7
Number of participating households	19	10	17	10	36	10
Sales and services						
Mean income for all households	58	2	90	3	73	3
Number of participating households	12	6	12	7	24	7
Food processing						
Mean income for all households	17	1	60	2	37	1
Number of participating households	5	3	6	4	11	3
Construction						
Mean income for all households	58	2	87	3	71	2
Number of participating households	8	4	12	7	20	6
Other nonfarm income sources						
Mean income for all households	76	3	154	5	112	4
Number of receiving households	40	21	61	37	101	28

The main motivation for participation in non-farm employment was that paddy production does not require households to allocate much of their labor time to the production process, as shown in Table 5.2. This has allowed households to reallocate their labor to non-farm activities. Another important motive for participating in non-farm activities was the availability of inputs for non-farm employment such as higher educational level of working household members and suitable premises for businesses. Younger household members, with higher education, have greater tendency to seek employment in the non-farm sector, hence resulting in a shortage of labor for paddy cultivation. This has been part of the reason for the adoption of labor-saving technologies in paddy cultivation by farmers, which was introduced to help reduce the rising cost of labor. Examples of labor-saving technology include direct seeding and fully mechanized harvesting of paddy which has greatly reduced the number of man-hours employed (Naziruddin, 2002).

Table 5.2: Motive for participating in non-farm employment[a]

Motives	% responding		
	Panchang Bedena	Bagan Terap	Total Sample (Sg. Besar)
Farming does not require much time	38.7	35.0	37.0
As a source of savings	17.7	15.6	16.7
Has input for non-farm activities	35.5	32.6	34.2
Availability of agricultural services	26.7	20.1	23.7
As a safety net	12.6	13.2	12.8
As a source of additional income	15.4	22.0	18.4
Availability of loans	3.1	12.2	7.2

[a]The numbers do not add up to 100 because more than one response is allowed.

There was also the category of other non-farm income sources. Only 28 percent of the household receive this type of income. These were unearned income which came from the receipt of remittances from migrating household members, government transfers such as pensions and zakat, and rental income from renting out properties such as land and houses. In addition to earning wages from non-farm activities, rural households may also be self-employed in non-farm activities such as operating a

grocery store, restaurants, workshops, construction companies, public transport provider, and homestay operators. However, the participation rate is quite low, at only around 12 percent of the total sample.

5.3 Distribution of income and assets among households: An overview

5.3.1 Structure of household income

The following analyses of household income and asset distribution were performed by disaggregating the sample by income terciles. The classification of households into income groups follows the categorization used by the Economic Planning Unit (EPU): top 20 percent income group for households with a monthly income of greater than or equal to RM5,600; middle 40 percent group for households with a monthly income of between RM2,300 and RM5,599; and bottom 40 percent group for households with a monthly income of less than RM2,300. In addition, another method of income categorization used is that from the Government-Transformation Program (GTP) – Roadmap (Malaysia, 2010): low income households as those with a monthly income of less than or equal to RM2,000 per month; poor households as those with a monthly income of less than or equal to RM750 per month; and hardcore poor households as those with a monthly income of less than or equal to RM440 per month. The correlation between the various sources of income and total household income are provided in Table 5.3.

Total non-farm income has the highest significant correlation with total household income, followed by total farm income and agricultural-wage income. Transfers and remittance income have the lowest correlation. The correlation between non-farm wage employment income and total income is much higher than the correlation between non-farm self-employment income and total income. In terms of

specific income sources, incomes from paddy and non-farm wage employment are the two most highly correlated income sources with total household income.

Table 5.3: Correlation coefficient between income sources and total household income

Income source	Total household income
Total farm income	**0.705****
Paddy income	0.577**
Oil palm income	0.421**
Agricultural-wage income	**0.303****
Total nonfarm income	**0.735****
Non-farm wage employment income	0.658**
Non-farm self employment income	0.269**
Property rental	0.222**
Land rental	0.200**
Remittance	0.048
Transfers	0.072

** Correlation is significant at the 0.01 level (2-tailed).

The distribution of household income is provided by Tables 5.4 and 5.5. The income distribution shows that about 9 percent (31 households) of the households are in the top 20 percent income group; 47 percent in the middle 40 percent group (169 households); and 44 percent (159 households) in the bottom 40 percent income group. However, the absence of non-farm income sources from household income have resulted in a decrease in the number of households to only 2 percent (8 households) in the top 20 percent group; 32 percent (114 households) in the middle 40 percent group; while an increase in the number of households in the bottom 40 percent group to 66 percent or 237 households. About 36 percent of the households in the bottom 40 percent group fall into the category of low income households, with a monthly income of less than or equal to RM2,000 as defined by the GTP. However, this group increases to 54 percent, from 129 households to 194 households if there is no contribution from non-farm income sources. This represents an 18 percent movement of households from the middle 40 percent group to the bottom 40 percent group. This implies that non-farm

income is an important factor in positioning a household in a particular income group, hence their vulnerability to poverty.

All households in the study areas earn income from farming, in particular, income from paddy cultivation and oil palm production as shown by Tables 5.4 and 5.5. The production of paddy in the area is commercial in nature, where all of the farm's output is sold to the market. On average, households in the area had about 67 percent of their income from this income earning activity. The share of non-farm income (25.8 percent) was much larger than agricultural-wage income (7 percent). The non-farm income shares can be broken down into a contribution of 18.3 percent from non-farm wage income; 3.6 percent from non-farm self-employment income; and 3.9 percent from other non-farm income sources such as remittances, pensions and other transfers as well as rental incomes. This was also observed by De Janvry and Sadoulet (2001) for rural households in Mexico where non-agricultural employment, transfers and remittances are the main source of off-farm income.

The high dependence of households on farm income implies that they are vulnerable to any shocks that would result in a reduction in crop yield especially shocks that are due to climate changes that are common to all households. In the event of any negative shocks, households in the bottom 40 percent group are the most vulnerable as they could fall into the category of poor households, as farm income contributed up to 84 percent of their total income. This is followed by households in the middle 40 percent group with a farm income share of 66 percent. Without the non-farm income component, the number of low-income as well as poor households would be much higher than the above findings, hence suggesting that non-farm income sources are important in reducing a household's probability of falling into poverty.

Table 5.4: Structure of household income (by income level)

	All households		Income Terciles					
			Top 20%		Middle 40%		Bottom 40%	
	(N = 359)		(N^a = 31) (N^b = 8)		(N^a = 169) (N^b = 114)		(N^a = 159) (N^b = 237)	
Income source	**RM**	**SD**	**RM**	**SD**	**RM**	**SD**	**RM**	**SD**
Farm income	1976.39	1057.03	3612.58	1784.84	2255.76	844.65	1360.45	421.45
Paddy income	1661.57	928.08	2722.26	1630.39	1920.44	853.33	1179.63	382.75
Oil palm income	314.82	498.99	890.32	928.93	335.33	465.63	180.82	293.75
Agricultural-wage income	205.38	375.35	467.13	529.91	236.39	433.18	121.38	211.72
Non-farm income (NFY)	758.10	1203.20	3113.39	1926.99	904.29	970.81	143.50	285.70
Wage income	538.53	1045.60	2352.68	1940.11	644.54	883.67	72.14	235.70
Self-employment income	104.69	456.60	417.74	1061.49	137.47	459.72	8.81	64.03
Other non-farm income	114.88	309.95	342.97	604.19	122.27	328.39	62.56	143.82
Rental income	47.75	199.66	220.39	477.47	49.96	181.85	11.74	68.67
Transfer & remittance	67.13	206.01	122.58	283.68	72.31	245.98	50.82	125.10
Total income with NFY	2939.87	1742.69	7193.10	1635.65	3396.44	813.63	1625.33	397.64
Percapita income (with NFY)	908.60	814.58	2346.20	1054.62	848.71	219.04	360.73	109.21
Total income without NFY	2181.78	1184.97	4079.71	1976.25	2492.17	949.22	1481.82	423.23
Percapita income (without NFY)	678.05	616.53	1614.71	973.28	629.08	259.23	332.93	114.37

Note: N^a is the number of households with total income which includes non-farm income sources; N^b is the number of households with total income without non-farm income sources.

Table 5.5: Structure of household income (by income shares)

	All households		Income Terciles					
			Top 20%		Middle 40%		Bottom 40%	
	(N = 359)		(N^a = 31) (N^b = 8)		(N^a = 169) (N^b = 114)		(N^a = 159) (N^b = 237)	
Income source	**%**	**SD**	**%**	**SD**	**%**	**SD**	**%**	**SD**
Farm income	67.23	23.86	50.22	21.98	66.42	24.05	83.71	17.81
Paddy income	56.52	25.00	37.85	22.17	56.54	24.32	72.58	20.34
Oil palm income	10.71	14.77	12.38	11.33	9.87	14.21	11.13	15.97
Agricultural-wage income	6.99	11.79	6.49	7.75	6.96	12.08	7.47	12.18
Non-farm income	25.79	23.98	43.28	24.87	26.62	25.39	8.83	14.95
Wage income	18.32	21.71	32.71	25.53	18.98	24.05	4.44	12.04
Self-employment income	3.56	9.38	5.81	15.01	4.05	11.36	0.54	3.35
Other non-farm income	3.91	8.70	4.77	8.44	3.60	9.20	3.85	8.22
Rental income	1.62	4.74	3.06	6.46	1.47	5.17	0.72	3.67
Transfer & remittance	2.28	6.90	1.71	4.53	2.13	6.82	3.13	7.33

Note: N^a is the number of households with total income which includes non-farm income sources; N^b is the number of households with total income without non-farm income sources.

Overall, the average income of households in the sample ranged from RM1,625 to RM7,193 per month, with an average of RM2,940 per month. However, without the non-farm income component, the average monthly incomes are lower, ranging from RM1,482 to RM4,080. The average income of households in the bottom 40 percent group (RM1,625) was above the national average of RM1,440 for this group. In terms of income share, the proportion of non-farm income declines as one moves down the income distribution with the top 20 percent income group earning 43 percent of non-farm income while the contribution is only about 9 percent for those in the bottom 40 percent group. In contrast, the proportion of farm income increases as one moves down the income distribution with the top 20 percent group earning 50 percent and bottom 40 percent earning up to 84 percent. This indicates that farm income is of particular importance to the lower income group. Income from agricultural-wage employment provided the lowest return to farm households. This was also observed by Berdegué et al. (2001) for rural households in Latin America and the Caribbean's. None of the households across the income groups derives more than 8 percent of their income from agricultural-wage labor. The level of income from agricultural-wage decreases as one move down the income terciles, however, in terms of income shares it increases with the movement down the income distribution.

On average, the income earned by households in the top 20 percent income group is about 4.4 times higher than those in the bottom 40 percent group. In terms of farm income households in the richest tercile earns 2.7 times higher farm income compared to those in the bottom 40 percent group. The differences in non-farm income is more striking where households in the richest tercile earned 21.7 times the amount of non-farm income earned by those in the lowest tercile. This indicates that non-farm income is more unequally distributed compared to farm and agricultural-wage incomes. The one-way ANOVA results shown in Appendix C confirm that the variation in mean

percapita income for each income group is significantly different except for the difference in the mean percapita income between the middle and bottom income groups.

There are three sources of non-farm income: non-farm wage employment income, non-farm self-employment income and other non-farm income. The richest households derive about 76 percent of their non-farm income from non-farm wage employment while those in the lowest tercile earn about 50 percent of their non-farm income from the same source of non-farm employment. The contribution of non-farm self-employment income is the lowest across all income terciles and the proportion to total non-farm income decreases with the movement down the income tercile. Households who are involved with self-employment are usually involved in construction, retail trade, automotive workshops, transportation, and food processing. The establishment of a business often requires significant capital investment, which causes some households to have difficulty in venturing into more profitable self-employed businesses. About 34 percent of those with their own businesses have reported shortage of capital as the main problem of their business ventures, followed by management problems (32 percent) and shortage of workers (14 percent). This may also suggest that households in the lowest income tercile might have entry barriers into higher-return activities. In general, the proportion of other non-farm income, such as incomes from remittance, pensions, zakat, and rental income, in total non-farm income, decreases as one move down the income terciles. Households in the top 20 percent group receive a much higher level of other non-farm income, in particular from rentals, compared to the other two income groups.

The number of households participating in various income-generating activities is also statistically significant between income groups for all activities except for non-farm self-employment. Results from the multiple comparisons of activity participation using the Games-Howell post-hoc test (Appendix D) show that the differences in non-

farm wage employment are significantly different at the 0.05 level of significance, among the three income groups except between the high and middle-income groups.

Table 5.6: Participation by activity and income group

Employment participation	Total sample		Top 20%		Middle 40%		Bottom 40%	
	No.	%	No.	%	No.	%	No.	%
Agricultural-wage employment	130	36.2	17	53.1	64	37.9	49	31.0
Non-farm wage employment	114	31.8	27	84.4	71	42.0	16	10.1
Non-farm self-employment	31	8.6	8	25.0	20	11.8	3	1.9
Type of non-farm employment								
Management	58	16.2	17	54.8	32	18.9	9	5.7
Public service	36	10.0	9	29.0	25	14.8	2	1.3
Manufacturing	4	1.1	1	3.2	3	1.8	-	-
Technical	8	2.2	1	3.2	7	4.1	-	-
Sales & service	24	6.7	6	19.4	17	10.1	1	0.6
Food & accommodation	11	3.1	5	16.1	4	2.4	2	1.3
Construction	20	5.6	9	29.0	6	3.6	5	3.1

Table 5.6 shows the participation rates of households in different income activities, which were differentiated by income groups. The results revealed that households from the study areas earn income from a variety of activities. Overall, participation in non-farm self-employment was the lowest compared to agricultural-wage employment and non-farm wage employment. Part of the reason may be due to the lack of insurance or safety net which will lead to self-protection by being cautious in their employment decisions. Therefore, wage labor is preferred to riskier but more profitable business activities. This was also observed by Morduch (1994) for households who lack access to credit.

The participation of households with at least one member employed in non-farm wage employment is comparatively high for households in the high and middle income groups. The participation is about 84 percent and 42 percent for the high and middle income groups, respectively. In terms of the type of non-farm activities the majority of

the households in all three income groups are engaged in management type employment followed by government (or public service) employees, sales and services employees and construction workers. These differences are also reflected in the percentage shares in total income by activity (Table 5.5). Non-farm wage employment is the most important off-farm income source for all income groups; however, for the bottom 40 percent group it only contributes about 4 percent to their total household income. For the other two groups it accounts for about 33 percent and 19 percent, respectively.

A majority of the households with agricultural-wage employment (about 95 percent) earn an income below the national poverty line income of RM800 per month, from this activity. More specifically, 47 percent of these households were from the middle income group and 48 percent from the low income group. This indicates that agricultural-wage employment was a low-return activity and that households participating in this activity were involved in a survival-led diversification strategy as depicted in the conceptual framework (Figure 4.1). This was also observed by Stifel (2010) for rural Madagascar where households in the bottom-end of the income distribution were found to be combining family farming and agricultural-wage employment.

Conversely, high return non-farm wage income was of importance to the top and middle income groups. About 83 percent of the households who were involved in non-farm wage employment were earning more than RM800 per month, from this activity. In particular, 89 percent and 87 percent of these households were from the high and middle income groups, respectively. This indicates that non-farm wage employment was a high-return activity and that households participating in this activity were involved in an opportunity-led diversification strategy. This was also consistent with the findings by Lay et al. (2009) for rural households in Burkina Faso. Another similar observation was by Haggblade et al. (1989) for areas with good agricultural potential

and by De Janvry et al. (1991) who have stressed the importance of the availability of non-farm employment opportunities resulting from market access.

Most of the non-farm wage labor employment was either in the public or private service sector with the participation from 145 individuals in the high-return activities and 49 individuals in low-return activities. The most common high-return activities were in clerical work, teaching, construction, and sales while for the low-return activities, the only common activity was the low paying clerical work. Households with micro and small businesses were involved in a fairly wide range of activities, primarily in small-scale construction, small workshops, retailing and food stalls. This suggests that low and high-return employments are available in segmented markets.

Table 5.7 provides a more specific analysis of the participation rate in non-farm activities and the respective income shares by income groups. The income share is calculated only for households that are involved in non-farm employment. In general, participation in high-return non-farm employment activities was concentrated among the households in the high-income group. However, the income share derived from high-return activities was by far the highest for households in the medium income group (53 percent).

Table 5.7: Participation and income shares from non-farm employment by income group (%)

	Participation			Income share		
Income group	**Overall**	**High-return**	**Low-return**	**Overall**	**High-return**	**Low-return**
Top 20%	90.3	83.9	6.5	37.8	37.6	0.3
Medium 40%	51.5	43.2	8.3	56.6	52.8	3.8
Bottom 40%	11.9	5.0	6.9	5.6	3.3	2.3

Households in the low income group had the lowest participation in both low- and high-return non-farm employments. The low participation in non-farm employment may be partly due to the existence of barriers which had effectively excluded these

households from diversification strategies which include high-return non-farm activities. Another possible reason would be that the households' income earned from agricultural activities was sufficient to cover family expenses. The greater concentration of high- and medium-income households in high-return non-farm employment activities will likely increase the level of inequality in rural areas.

5.3.2 Income shares and income specialization

The average income shares just presented indicate the importance of different income generating activities to rural households. However, the average figures do not reflect the dependence of households on a single activity. Therefore, households are classified as specialized if an activity accounts for more than 50 percent of its income. If an activity accounts for more than 75 percent of total household income then the household is classified as highly specialized. Following this classification, only about 81 percent of the households are specialized in farming, while only 54 percent is highly specialized (Table 5.8). This is not surprising as these households are located in a major granary area where the main economic activity is paddy production. This also indicates that the highest degree of specialization is in farming.

In terms of non-farm wage employment about 11 percent of the households had more than 50 percent and only 2 percent had more than 75 percent of their income from this income-generating activity. Although the participation in agricultural-wage employment was the second highest (130 households or 36 percent) after farming, only about 1 percent of these participating households was found to be specializing in agricultural-wage employment. This was also reflected in the share of agricultural-wage income, which was the lowest, in total household income (as shown in Table 5.5). In addition, specialization in non-farm self-employment was much lower due to the low participation rate.

Table 5.8: Specialization by activity and income group

Specialization level	% of households			
	Total sample (N=359)	Top 20% (N=31)	Middle 40% (N=169)	Bottom 40% (N=159)
Full time farmers	28.7	0.0	7.8	20.9
Specialized in farming	81.1	48.4	74.0	97.5
Highly specialized in farming	54.0	16.1	45.0	71.1
Specialized in agricultural-wage employment	1.1	0.0	1.8	0.6
Highly specialized in agricultural-wage employment	0.0	0.0	0.0	0.0
Specialized in non-farm wage employment	10.9	25.8	11.8	1.9
Highly specialized in non-farm wage employment	1.7	6.5	1.8	0.0
Specialized in non-farm self-employment	0.8	3.2	1.2	0.0
Highly specialized in non-farm self-employment	0.0	0.0	0.0	0.0

Comparing these results to the number of participating households by income group also showed a high degree of specialization in farming. About 98 percent of the households in the bottom 40 percent group were specialized in farming while out of these households 71 percent of them had been found to be highly specialized, especially in paddy production. In non-farm wage employment about 26 percent of the participating households in the high income group had more than 50 percent of their income share from this income source while only about 7 percent have more than 75 percent share of this income. In terms of participation in agricultural-wage employment, households in the high income group have the highest participation (53 percent), however, no specialization was observed for households in this income group. Despite the lower participation rate for the other two income groups some specialization was observed. These figures also showed that non-farm wage employment generated, on average, a bigger income share than agricultural-wage employment. This indicates the importance of non-farm wage employment for participating households.

5.3.3 Distribution of household assets

5.3.3.1 Human capital

Table 5.9 shows a few descriptive for household characteristics based on income groups. Households in the top 20 percent income group had the lowest number of dependents and the highest number of working members compared to the other income groups. There was not much difference in the mean age of household heads. Although the households in the middle and low income groups had a slightly larger household size, they had a lower number of working members.

Table 5.9: Household characteristics

	Income tercile		
Human capital items	**Top 20% (N = 31)**	**Middle 40% (N = 169)**	**Bottom 40% (N = 159)**
Age of household head (years)	50	52	53
Number of household members	4	5	5
Number of dependents	1.3	2.2	3.1
Number of working members	3.1	2.3	1.9

The average education level of the head of households was quite similar among households in all income groups, which was about 9 years of education or at the SPM level, as shown in Table 5.10. This was followed by primary school and SRP level education for both the top and bottom income terciles. However, the progress in educational development in Malaysia had resulted in younger household members having more schooling compared to their parents, where the average education level of working age household members was about 11 years, hence increasing the human asset base in the Malaysian rural areas.

In addition to formal education, household members also receive some form of training. The study found that about 33 percent of the sample had received some training for the last three years. However, the trainings were mostly agricultural in

nature especially those that were related to paddy cultivation such as yield enhancement (89 percent), crop management (46 percent), and machinery operations (5 percent). Other types of training include those that were related to marketing, entrepreneurship, sewing, and food processing (26 percent).

In terms of the average education of working members, households in the top 20 percent group had higher average education years for their working members compared to those in the middle and bottom 40 percent group. The average education variable had been found to have a strong positive correlation with total household income which was statistically significant for households in the high income group ($r = 0.431$, $p < 0.05$) and middle income group ($r = 0.205$, $p < 0.01$).

Table 5.10: Education level of working-age members

	Total sample		Top 20%		Middle 40%		Bottom 40%	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Education level of head of household (level):								
No formal education	18	5.0	1	3.2	9	5.3	8	5.0
Primary school	96	26.7	8	25.8	37	21.9	51	32.1
SRP[a]	93	25.9	8	25.8	51	30.2	34	21.4
SPM[b]	146	40.7	13	41.9	68	40.2	65	40.9
STPM[c]	6	1.7	1	3.2	4	2.4	1	.6
Avg. education of working-age members (years)		9.5		13		9.4		9
Percapita income (RM)		908.60		2346.20		848.71		360.73
Participation in non-farm labor employment (%)		37.3		87.5		51.5		12.0

Note: [a]SRP is lower certificate of education; [b]SPM is Malaysian certificate of education; [c]STPM is Malaysia higher school certificate.

5.3.3.2 Natural capital

The distribution of total cultivated land and the size of land owned were shown in Tables 5.11, 5.12 and 5.13. The average size of land owned by households in the study area was about 1.64 hectares. About 88 percent of the households own the paddy land which they cultivate. Those without any land ownership (12 percent) were able to

produce on either rented land (17 percent) or through share-cropping arrangements (3 percent). Another common production arrangement among farm households in the area was the production of paddy on a combination of own and rented land (29 percent). The availability of rented land and the existence of share-cropping arrangements had been made possible partly because of the aging farm population. Most of the households in the highest income tercile (36 percent) were cultivating more than 4 hectares of land, hence providing them with the highest total farm income compared to households in the other income groups. On average, households in the middle and bottom income terciles were cultivating between 1.0 hectare to 1.99 hectares of land, with 36 percent and 67 percent of the households, respectively.

In general, total cultivated area had a negative correlation with household participation in non-farm employment. However, this negative correlation had been found to be significant for households in the high and middle income groups. There was also a significant positive correlation between total cultivated area and total household income, especially for households in the middle income group ($r = 0.255$, $p < 0.01$) and bottom income group ($r = 0.267$, $p < 0.01$), through its effect on farm income.

Table 5.11: Size of cultivated land

	Total sample		Top 20%		Middle 40%		Bottom 40%	
Landholdings	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0.1 - 0.99 ha	24	6.7	1	3.2	8	4.7	15	9.4
1.0 - 1.99 ha	176	49.0	7	22.6	61	36.1	107	67.4
2.0 - 2.99 ha	90	25.1	8	25.8	50	29.6	32	20.1
3.0 -3.99 ha	40	11.1	3	9.7	33	19.5	5	3.1
> 4.0 ha	29	8.1	12	38.8	17	10.1	-	-
Avg. size (ha)	2.4		4.5		2.7		1.7	
Percapita income (RM)	908.60		2346.20		848.71		360.73	

Another important land-related variable is the amount of land owned. This variable also had a negative correlation with participation in non-farm employment for all households except for households in the top and middle income groups where the negative correlation had been found to be significant. However, the proportion of land

owned does not have any significant effect on household income. In terms of the distribution of owned cultivated land, the average size of cultivated land owned by a household tends to increase as one move up the income group. Richer households owned, on average, 3 hectares of paddy land while those in the middle and bottom income group owned about 2 hectares and 1 hectare respectively. Out of the total cultivated area, households in each of the income groups earned more than 60 percent of the land.

Table 5.12: Size of owned land

	Total sample		Top 20%		Middle 40%		Bottom 40%	
Landholdings	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
None	44	12.3	2	6.5	11	6.5	31	19.5
0.1 - 0.99 ha	45	12.5	-	-	18	10.7	27	17.0
1.0 - 1.99 ha	152	42.3	9	29.0	61	36.1	82	51.5
2.0 - 2.99 ha	77	21.5	5	16.1	55	32.5	17	10.7
3.0 -3.99 ha	24	6.7	5	16.1	17	10.1	2	1.3
> 4.0 ha	17	4.7	10	32.3	7	4.1	-	-
Avg. size	1.6		3.0		1.9		1.1	
Land owned (%)	68.6		71.5		72.2		64.0	
Percapita income (RM)	908.60		2346.20		848.71		360.73	

In terms of land ownership, about 88 percent of the farmers were operating on their own land with 82 percent for low income households and 94 percent for high income households as shown in Table 5.12. Paddy farmers in the area were also able to rent land for cultivation and also be involved in share-cropping production arrangements. This indicates the existence of a land market that allows farmers to expand their paddy production hence increasing their farm income. On average, 53 percent of the sampled households were producing on rented land in addition to the land they owned. In terms of share cropping, only about 6 percent of the sampled farmers were involved in this production arrangement. The proportion of low income households producing on rented land (21 percent) was higher than those in the high-income group (13 percent).

Table 5.13: Income shares by landownership

Category of land size owned	Income shares by source						Percapita income (RM)	Rented land (ha)	Land under sharecropping (ha)	Total land owned (ha)	Total cultivated land (ha)
	Farm income	Ag-wage income	Non-farm wage income	High-return non-farm wage income[a]	Low-return non-farm wage income[a]	Non-farm self-employment income					
Landless	71.57	11.97	13.83	76.4	23.6	2.63	578.53	1.51	0.37	0.00	1.88
0.1 - 0.99 ha	74.51	6.88	16.45	71.6	28.4	2.16	787.81	1.09	0.03	0.56	1.67
1.0 - 1.99 ha	77.73	6.00	12.83	78.9	21.1	3.44	759.26	0.54	0.06	1.36	1.96
2.0 - 2.99 ha	82.38	6.44	9.73	83.3	16.7	1.45	957.47	0.34	0.02	2.36	2.72
3.0 -3.99 ha	80.03	5.72	13.19	90.5	9.5	1.09	1131.12	0.59	0.00	3.40	3.99
> 4.0 ha	77.43	5.80	16.51	100.0	-	0.26	1628.78	1.13	0.00	5.01	6.14

Note : [a] The low and high return non-farm wage employment is based on the average monthly earnings from primary employment in different employment sectors. The employment which provides a monthly income below the poverty line income of RM800 per month is defined as a low-return employment. Households with members whose primary occupation is in this type of employment are identified as being employed in low-return activities. The converse applies to high-return activities.

Because the importance of non-farm employment to household income was generally thought to depend on land ownership, it was, therefore, important to examine the distribution of income shares across landholding categories. This was done in Table 5.13. Six landholding categories were developed based on the information gathered from landownership holdings: the landless; those with 0.10 to 0.99 ha per household; between 1.00 and 1.99 ha per household; between 2.00 and 2.99 ha per household; between 3.00 and 3.99 ha per household; and more than 4.00 ha per household.

The landless (12.5 percent of the sample) received quite a considerable share (72 percent) of income from farming despite not having any land of their own. However, they do have access to land both through renting and share-cropping arrangements. This finding is contrary to the findings in other developing countries such as those by Estudillo et al. (2001) for the Philippines and Van den Berg and Kumbi (2006) for Ethiopia, where the landless are often the poor who have mostly depended on non-farm income sources. This implies a smaller share of agricultural income and a considerable share of non-farm income. Landless households were renting on average 1.51 ha and were involved in share-cropping production arrangement with an average land size of 0.4 ha. This had enabled them to have an average cultivated area of 1.88 ha per household. Income from farming thus accounts for 71.6 percent of total income of the landless.

The landless can be assumed to have a strong preference for farming. The availability of a land rental market had enabled them to have land to farm hence extending the size of their farm operations. This also suggests that they do not have to abandon farming completely for non-farm and agricultural-wage employments. For households that do own land, farming income shares were not surprisingly higher. This was also observed by Ferreira and Lanjouw (2001) for landed households in the Brazilian Northeast. Farm income shares were highest for households with 2.00 to 2.99

ha per household (82.4 percent) and lower for the largest landowning category (77.4 percent).

The agricultural-wage income was most important to the landless, as also observed by Ferreira and Lanjouw (2001). The landless obtained about 12 percent of their income from agricultural-wage labor earnings, while those with landholding categories of 0.10 up to 2.99 ha per household received between 6.0 percent and 6.9 percent from this income source. However, households with more than 3 ha of land per household, agricultural-wage income were much lower, ranging from 5.7 percent to 5.8 percent.

Both the landed and landless households were involved in non-farm wage employment. Table 5.13 also indicated that the low- and high-return non-farm wage employment were important essentially to the landless and households with a landholding size of less than 1 ha. The importance of low-return non-farm activities was consistent with the view that these activities were regarded as residual activities that households undertake together with agricultural-wage employment in order to meet their expenditure requirement. High-return non-farm wage employment was also important to landed households with landholdings of more than 1 ha. Households with 1.0 to 1.99 ha of land per household, for example, earned as much as 78.9 percent of their income from high-return wage labor activities. Even households with the largest landholding size of more than 4 ha earned all of their non-farm income from high-return wage-labor employment.

5.3.3.3 Physical capital

Physical asset were mainly agricultural assets such as machinery and equipment. Although livestock had often been categorized as physical assets, it was not included in this study as none of the households in the sample was involved in any commercial

production of animals. The farm animals that they do own were for home consumption only. On average, households own about RM4,761 worth of physical capital with 83 percent owning some form of machinery and equipment as shown by Table 5.14. A correlation analysis revealed that there was a positive significant relationship between ownership of equipment with farm income and agricultural-wage income at the 0.05 significance level. There was also a significant positive relationship between values of equipment and farm income ($r = 0.234$, $p < 0.01$) as well as with agricultural-wage income ($r = 0.470$, $p < 0.01$).

Table 5.14: Average value of physical assets by income group

	Total sample		Top 20%		Middle 40%		Bottom 40%	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Ownership of equipment	296	82.5	29	93.5	147	87.0	120	75.5
Participation in ag-wage employment	130	36.2	17	53.1	64	37.9	49	31.0
Average value of equipment (RM)		4761.55		9227.10		5368.66		4711.75

The average value of equipment owned increases as one moves up the income terciles. The highest income group had the largest value of farm implements, with RM9,227 while the average value of equipment owned by the lowest income group was about half of that owned by the high income households. The high income group had a much higher mean value of physical assets as they own tractors and lorries in addition to smaller farm machinery and equipment. These expensive farm implements were used in land preparation and in the transportation of inputs to farmers and of paddy from the rice fields to the collection centers in the study area. Other types of agricultural machinery and equipment owned by farm households include multipurpose blowers, water pumps, and brush cutters. Ownership of agricultural equipment had enabled households to participate in agricultural-wage employment, where about 36 percent of the households were involved in providing agricultural services to other farms.

5.3.3.4 Financial capital

The financial assets of a household include having borrowing experience and other non-labor incomes (pensions, zakat, and remittances). As shown in Table 5.15, only 28 percent (102 households) of the sampled households received at least one form of non-labor income with a majority of them receiving between RM100 and RM500 per month. Among the sources of non-labor incomes, remittances were most common among the recipients. About 13 percent of them received remittances, however, in terms of low and high income households it was observed that there were a higher proportion of households receiving remittances among the higher income group. This was because they had more working members and thus were more involved in non-farm wage employment. Income from land and property rentals was common among households in the top and middle income terciles, while for the low income group remittance was the most often received other non-farm income.

Table 5.15: Distribution of financial assets

	Total sample		Top 20%		Middle 40%		Bottom 40%	
Financial capital	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Credit	258	71.9	30	96.8	126	74.6	102	64.2
Receive non-labor income	102	28.4	11	35.5	32	18.9	35	22.0
Sources of non-labor income								
Land Rental	29	8.1	8	25.8	16	9.5	5	3.1
Property rental	11	3.1	4	12.9	6	3.6	1	.6
Remittances	46	12.8	6	19.4	16	9.5	24	15.1
Transfers	16	4.5	2	6.5	8	4.7	6	3.8
Category of non-labor income								
RM0	281	78.3	20	64.5	137	81.1	124	78.0
RM100 - RM500	56	15.6	4	12.9	19	11.2	33	20.8
RM501 - RM1000	12	3.3	3	9.7	7	4.1	2	1.3
> RM1001	10	2.8	4	12.9	6	3.6	-	-

About 72 percent of the households have had some borrowing experiences for the last three years. The main purpose of borrowing for about 45 percent of the households in general was for the purchase of non-land agricultural inputs as listed in

Table 5.16. This was followed by buying non-agricultural inputs for their non-farm businesses, buying land, and loan repayments, especially for the high income group.

Table 5.16: Loan usage

	Total sample		Top 20%		Middle 40%		Bottom 40%	
Loan usage	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Buying necessities	29	8.1	6	19.4	11	6.5	12	7.5
Buying agricultural inputs	162	45.1	9	29.0	81	47.9	72	45.3
Buying non-agricultural inputs	21	5.9	2	6.5	9	5.3	10	6.3
Social events	3	0.8			3	1.8		
Buying land	15	4.2	4	12.9	6	3.6	5	3.1
Land preparation	4	1.1			4	2.4		
Loan repayment	16	4.5	5	16.1	6	3.6	5	3.1
Total	250	69.6	26	83.9	120	71.0	104	65.4

5.3.3.5 Social capital

Social capital measures a household's access to social networks and institutions, which include participation in various formal institutions, such as farmer associations, cooperatives, village-level committees, and religious groups. The level of household involvement in village community events were important as they can influence access to informal networks, level of trust among community members and access to information which were all important in enhancing a household's potential in securing non-farm self-employment and agricultural-wage employment opportunities. In general, social capital had a positive correlation with all income sources. A summary of a correlation analysis between social capital and various income sources, as shown by Table 5.17, revealed a positive significant relationship between social capital index and non-farm self-employment income as well as farm and agricultural-wage incomes. The empowerment and political action component of social capital had no significant effect on any of the income sources.

Table 5.17: Correlation between social capital and income sources

Social capital item	Farm income	Ag-wage income	Non-farm wage income	Non-farm self employment income	Total household income
Social capital index	0.156**	0.170**	0.229	0.217**	0.264**
Social capital component:					
Group & network	0.109*	0.212**	0.018	0.012	0.330**
Trust & solidarity	0.483**	0.017	0.064	0.160**	0.260**
Collective action & cooperation	0.216**	0.062	0.020	0.043	0.330**
Information & communication	0.066	0.065	0.182**	0.003	0.203**
Social cohesion & inclusion	0.161**	0.080	0.077	0.028	0.003
Empowerment & political action	0.103	0.033	0.018	0.032	0.059

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

5.3.3.6 Locational capital

The existence of a good road system and public transportation in rural areas will affect the availability and accessibility of goods and services to rural households and employment opportunities in the non-farm sector. The study areas were well equipped with public infrastructure including a good quality road system. On average, households were located about 1.6 kilometers from the main road leading to the town center and it took on average about 22 minutes to reach the town center of Sungai Besar. Households also had access to primary and secondary schools, health clinics and public transportation. Despite the good quality roads, the frequency of public transportation provision was not quite satisfactory. This was because only 19 percent of the area was serviced by public transport providers. Areas that do have public transportation were supplied with bus and taxi services for every 30 minutes or every hour. Therefore, most of the households (98 percent) had mainly depended on their own mode of transportation. The existence of a growing rural town of Sungai Besar had provided non-farm employment opportunities to households in both Panchang Bedena and Bagan Terap, especially in public services in various government agencies and local government departments. The town of Kuala Selangor, which was about 120 kilometers

from the town of Sungai Besar, had also provided non-farm employment opportunities to local households.

In general, the time taken to reach the next rural town center had a negative correlation with all income sources and the correlation was significant for total income and non-farm income in particular non-farm self-employment income. This was observed for households in the bottom 40 percent group. Conversely, household location in Panchang Bedena was positively correlated with all income sources with the correlation being positively significant for total income ($r = 0.271$, $p < 0.01$), agricultural-wage ($r = 0.108$, $p < 0.05$), and non-farm self-employment incomes ($r = 0.177$, $p < 0.01$). This was because the town of Sungai Besar was located in Panchang Bedena and the households of Panchang Bedena were closer to other rural towns such as Kuala Selangor which provided them with more non-farm employment opportunities.

5.4 Findings from cluster analysis

The dendrogram resulting from the hierarchical cluster analysis allowed the use of visual examination in determining the optimal number of clusters. For the cluster analysis, the 4 cluster solution provided the optimal balance between parsimony and homogeneity. Using the k-means cluster procedure, 17% of all cases (60 out of 359 cases) had been reassigned to another cluster. The clustering of farm households indicates that each group had a unique combination of assets, which helped to explain each livelihood strategy. The differences in household assets of the groups formed through cluster analysis were described and discussed in the following section.

5.4.1 Livelihood clusters and characteristics of livelihood strategies

The livelihood clusters were defined using a combination of hierarchical and non-hierarchical cluster analyses. Using cluster variables of percentage shares of farm

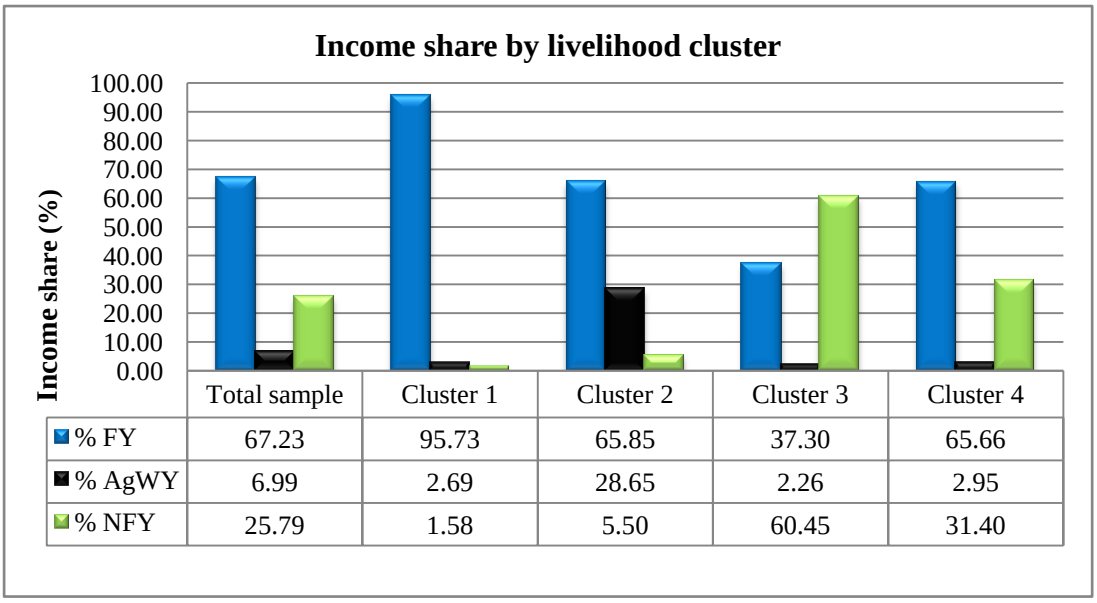
income, agricultural-wage income and non-farm income, the 359 sample households were categorized into four clusters of mutually exclusive choice of livelihood strategies. On the basis of this classification, the clusters of distinct livelihood strategies were obtained and are shown in Table 5.18.

Table 5.18: Livelihood strategies cluster membership

Cluster	Livelihood strategy	Number of households	Percentage
1	Highly specialized in farming	162	45.13
2	Farming and agricultural-wage employment	59	16.43
3	Specialization in non-farm employment	68	18.94
4	Farming and non-farm employment	70	19.50

The proportions of income from each income source for each livelihood cluster were shown in Figure 5.1. It was observed that most households had a significant share of farm income in their total household income, ranging from 66 percent to 96 percent, except for households in cluster 3, where the share of farm income was only about 37 percent. The significant share of farm income in total household income was expected as these households were paddy farmers operating in a granary area.

Households from cluster 1 were highly specialized in farming and earned 96 percent of their household income mainly from paddy production. Consequently, this livelihood strategy was labeled 'highly specialized in farming'. With an average farm income share of 66 percent, households in cluster 2 also obtained about 29 percent of their income share from agricultural-wage income. Since the share of agricultural-wage income was quite significant for households in this cluster, compared to other clusters, this cluster was hence labeled as 'farming and agricultural-wage employment'.



	Total sample	Cluster 1	Cluster 2	Cluster 3	Cluster 4
% FY	67.23	95.73	65.85	37.30	65.66
% AgWY	6.99	2.69	28.65	2.26	2.95
% NFY	25.79	1.58	5.50	60.45	31.40

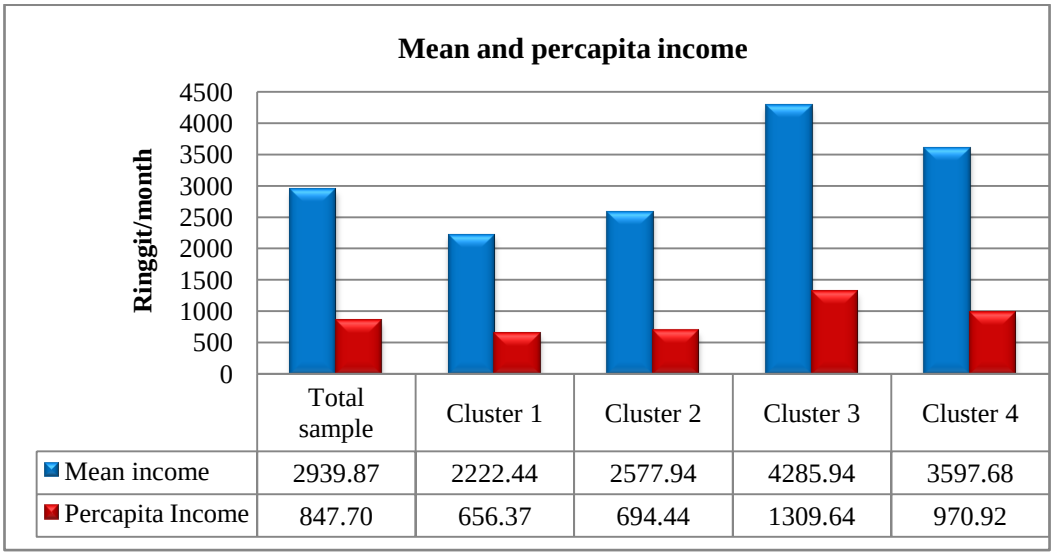
Figure 5.1: Household income shares in total income by income sources

Note: FY = Farm income; AgWY = Agricultural-wage income; NFY = Non-farm income
Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment.

Households in cluster 3 earned more than 50 percent of their income from non-farm income sources (61 percent) with only 37 percent share of household income from farming, hence this livelihood cluster was labeled 'specialization in non-farm employment'. Finally, as in the other two clusters, households in cluster 4 also earned a significant portion of their income from farming (66 percent). In addition they also had a non-farm income share of almost half of the share of farm income (31 percent) but this share was less than 50 percent hence it does not imply specialization in non-farm employment as in cluster 3. Therefore, the label 'farming and non-farm employment' was used to identify the fourth livelihood cluster.

The level of percapita income for each livelihood cluster is illustrated by Figure 5.2. Households whose livelihood activities were dominated by non-farm activities (cluster 3) had the highest percapita income (RM1,310) compared to households in the other clusters. This is followed by households in cluster 4 with RM971 per month. While households in cluster 1 (highly specialized in farming) had the lowest percapita

income of RM656 per month followed by households in cluster 2 with RM694 per month. All of the livelihood strategies of households in the study areas were able to generate an average monthly income above the national poverty line income of RM800 per month. The differences in the average monthly income could be due to the differences in asset endowments that, in turn, were causal factors for differences in livelihood strategies represented by the clusters.



	Total sample	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Mean income	2939.87	2222.44	2577.94	4285.94	3597.68
Percapita Income	847.70	656.37	694.44	1309.64	970.92

Figure 5.2: Monthly per capita income by livelihood strategy

Note: Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment.

An analysis of variance (ANOVA) was used to examine the variation of income between livelihood clusters (Appendix F). Each of the clusters was also statistically different from the other clusters for almost all of the cluster variables (Appendix E). Table 5.19 reports the results from the pair-wise comparison (t-statistics) of the statistically significant difference between mean percapita incomes among livelihood clusters. The full results of the comparisons were shown in Appendix G.

Table 5.19: Two cluster comparison t-test for equality of means

Hypothesis	Mean Difference	Std. Error Difference	t	df	Sig. (2-tailed)	Decision
H_0: $\mu_3 = \mu_1$; H_a: $\mu_3 > \mu_1$	653.27	126.36	5.170	77.29	.000	Reject H_0
H_0: $\mu_3 = \mu_2$; H_a: $\mu_3 > \mu_2$	615.19	134.46	4.575	94.17	.000	Reject H_0
H_0: $\mu_3 = \mu_4$; H_a: $\mu_3 > \mu_4$	338.72	139.88	2.422	105.95	.017	Reject H_0
H_0: $\mu_4 = \mu_1$; H_a: $\mu_4 > \mu_1$	314.55	76.39	4.118	103.12	.000	Reject H_0
H_0: $\mu_4 = \mu_2$; H_a: $\mu_3 > \mu_2$	276.48	89.15	3.101	125.72	.002	Reject H_0

Based on the computed t-statistics in Table 5.19, it can be concluded that livelihood clusters that combine farming and non-farm employment (clusters 3 and 4) will result in a higher percapita income. Table 5.20 presents the one-way ANOVA results and confirmed that the variations in mean percapita income were statistically significant among clusters ($F(3,355) = 20.730$, $p < .05$). Therefore, this finding had proven H_1 that livelihood strategies that combine farming with non-farm activities will result in significantly higher percapita income.

Table 5.20: One-way ANOVA for mean percapita income

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	22889255.329	3	7629751.776	20.730	.000
Within Groups	130658733.397	355	368052.770		
Total	153547988.726	358			

Table 5.21 shows the level of household participation by cluster and activities. A majority of the households in cluster 3 (91 percent) were involved in non-farm wage employment followed by households in cluster 4 with 70 percent. Participation in management-type non-farm employment as well as in sales and services was high for these livelihood clusters. Between these two clusters, participation as construction workers and in public services such as government employees was higher for households in cluster 3 compared to those in cluster 4.

Table 5.21: Participation by activity and livelihood clusters

Employment participation	Total sample		Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	No.	%	No.	%	No.	%	No.	%	No.	%
Agricultural-wage employment	130	36.2	39	24.1	59	100.0	12	17.6	20	28.6
Non-farm wage employment	114	31.8	1	0.6	2	3.4	62	91.2	49	70.0
Non-farm self-employment	31	8.6	3	1.9	2	3.4	14	20.6	12	17.1
Type of non-farm employment										
Management	61	17.0	1	0.6	2	3.4	30	44.1	28	40.0
Public service	29	8.1	-	-	1	1.7	21	30.9	7	10.0
Manufacturing	4	1.1	-	-			2	2.9	2	2.9
Technical	8	2.2	-	-	-	-	7	10.3	1	1.4
Sales & service	31	8.6	1	0.6	-	-	18	26.5	12	17.1
Food & accommodation	18	5.0	1	0.6	1	1.7	10	14.7	6	8.6
Construction	27	7.5	1	0.6			14	20.6	12	17.1

Note: Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment.

The distribution of households in each cluster according to income terciles was provided in Table 5.22. This classification was to determine whether households in the low and high income groups differ in terms of the livelihood strategies they choose.

Table 5.22: Distribution of cluster membership

Clusters	Total sample		Top 20%		Middle 40%		Bottom 40%	
	No.	%	No.	%	No.	%	No.	%
1	162	45.1	4	2.5	58	35.8	100	61.7
2	59	16.4	2	3.4	24	40.7	33	55.9
3	68	18.9	16	23.5	46	67.6	6	8.8
4	70	19.5	9	12.9	41	58.6	20	28.6
Total	**359**		**31**		**169**		**159**	

In general, the distribution of households from each livelihood cluster was quite even in the middle 40 percent income group except for households from cluster 2. This was in contrast to the more uneven distribution of cluster memberships in the high and low income groups. A majority of the households in the bottom 40 percent group (63 percent) as well as 34 percent from the middle income group mainly consist of those

who had chosen to be highly specialized in farming (cluster 1), which was the cluster with the lowest average income compared to the other livelihood clusters. In contrast, households in cluster 3, which was specialization in non-farm employment, mostly fall in the top 20 percent and middle 40 percent income group. In terms of percentages, 52 percent of the households in cluster 3 were in the high income group while 27 percent was in the middle income group.

Cluster 4, which had a 31 percent contribution from non-farm income also had a majority of its members (59 percent) in the middle income group and 29 percent in the bottom 40 percent group. Households in cluster 2, which combined farming and agricultural-wage employment, were mostly in the bottom 40 percent group (56 percent) and also in the middle income group (41 percent). In general, a majority of the households in clusters 1, 2, and 4 fell in the middle and bottom 40 percent income groups while households in cluster 3 were mostly in the high and middle income groups.

Table 5.23 shows the level of specialization by income-generating activities and livelihood clusters. As previously noted, households with more than 50 percent of their income coming from one income-generating activity were considered as being specialized in that specific activity. In addition, households with more than 75 percent of their income from one activity were categorized as being highly specialized. With these specialization categories, all of the households in cluster 1 were found to be highly specialized in farming, while a majority of the households in cluster 4 (97 percent), and cluster 2 (92 percent) had more than 50 percent of their income shares from farming. All of the households in cluster 2 were involved in agricultural-wage employment. The agricultural-wage income share for households in this cluster was also the highest as

shown by Figure 5.1. However, only 7 percent of these households were specializing in this income earning activity.

Table 5.23: Specialization by activity and livelihood clusters

Specialization level	% of households				
	Total sample (N=359)	**Cluster 1 (N=162)**	**Cluster 2 (N=59)**	**Cluster 3 (N=68)**	**Cluster 4 (N=70)**
Full time farmers	28.7	100.0	0.0	0.0	0.0
Specialized in farming	81.1	0.0	91.5	10.3	97.1
Highly specialized in farming	54.0	100.0	28.8	0.0	21.4
Specialized in agricultural-wage employment	1.1	0.0	6.8	0.0	0.0
Highly specialized in agricultural-wage employment	0.0	0.0	0.0	0.0	0.0
Specialized in non-farm wage employment	10.9	0.0	0.0	57.4	0.0
Highly specialized in non-farm wage employment	1.7	0.0	0.0	8.8	0.0
Specialized in non-farm self-employment	0.8	0.0	0.0	2.9	0.0
Highly specialized in non-farm self-employment	0.0	0.0	0.0	0.0	0.0

Note: Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment.

A majority of the households in cluster 3 (91 percent) were involved in non-farm wage employment. However, only 57 percent of the participating households were found to be specializing in this employment, which indicated that they were earning more than 50 percent of their income from non-farm wage employment. In addition, 9 percent of these households were highly specialized in non-farm wage employment as they have more than 75 percent of their income share from this income-generating activity. The high participation rate and the high level of specialization was reflected in the highest share of total non-farm income in total household income for households in this cluster compared to those in the other three livelihood clusters. Cluster 3 also had the highest participation in non-farm self-employment (21 percent) with about 3 percent of them specializing in this employment. As with cluster 3, all of the households in cluster 4 have some form of income from non-farm sources. However, none had been

found to specialize in non-farm wage or non-farm self-employment. The number of households participating in non-farm wage employment (49 households) in cluster 4 was also lower compared to those in cluster 3 (62 households). The lower participation was reflected in the much lower share of total non-farm income in total household income for households in cluster 4 as compared to cluster 3.

In order to further describe each of the livelihood strategies, Table 5.24 provides data on asset ownership for each cluster. The first strategy (cluster 1), highly specialized in farming, was the largest cluster which was employed by 162 households or 45 percent of total households in the sample. Therefore, this was the most common livelihood in the Sungai Besar granary area. About 60 percent of the households in this cluster were from Panchang Bedena. Households in this cluster had the lowest level of average education for their working members compared to households in the other three livelihood strategies. In terms of landholdings, these households had a mean cultivated area of about 2.3 hectares, which was the second highest after those in the 'farming and non-farm employment' cluster (cluster 4) with a holding size of 2.4 hectares and about 66 percent of the cultivated land was owned by the farmers. On average, they had a much lower average value of agricultural implements (RM4,841) compared to households in clusters 2 and 3. Most of the equipment they own was only for the use on their own farms, such as multi-purpose sprayers, grass cutter, and water pumps.

Cluster 2 (farming and agricultural-wage employment) represented the smallest cluster with only 16 percent of the total sample (59 households), making it the least common livelihood strategy. Households in this cluster had the second largest household size and the third highest number of years of education, after households in clusters 3 and 4, respectively. The mean cultivated area was about 1.9 hectares, with 59 percent ownership, hence the high contribution of farm income in total household income for these households. The mean value of farm implements owned was the

highest among the four clusters with an average of RM6,560 per household. In addition to multipurpose blowers, grass cutters and water pumps, household also owned tractors, either two-wheels or four-wheels, which were used in land preparation, either on their own farm or on other farms with a certain amount of payment. Other agricultural implements include lorries. The ownership of equipment had enabled all of the 59 households in this cluster to supplement their household income with agricultural-wage income by providing agricultural services to other farms. This was reflected in the substantial share of agricultural-wage income (29 percent) in total household income for this cluster. However, only 7 percent of the households in this cluster were found to be specializing in agricultural-wage employment.

Cluster 3, specialization in non-farm employment, represented only about 19 percent of the total sample. About 54 percent of the households in this cluster were from Panchang Bedena in which the town of Sungai Besar was located. Households in this cluster had the lowest number of dependents, which had enabled them to participate in non-farm employment. On average, this cluster also had the highest number of working members and the highest level of average education for its working members. This had also enabled households in this cluster to be more involved with non-farm employment. This was reflected in the highest share of non-farm labor income of 54 percent in their total household income. Out of this percentage, 46 percent was made up of non-farm wage income and 8 percent from self-employment income.

In terms of cultivated area, households in cluster 3 had the lowest cultivated area of only 1.54 hectares, hence the low contribution of farm income in total household income (37 percent). However, with greater participation in non-farm employment, these households earn more than double the average income of those in cluster 1. The smaller size of cultivated land seemed to “push” these households into alternative employment activities such as non-farm activities. This suggests that non-farm

employment had provided these households with an alternative to small landholdings which was consistent with the findings by De Janvry et al. (2005) for rural China. This finding implied that households in this cluster were less vulnerable to risks associated with agricultural production compared to households in the other clusters. These households also had the second highest average value for farm implements (RM5,275). This had enabled some of the households (16 percent) to supplement their income with agricultural-wage employment. The social capital index, however, was the lowest compared to the other three clusters. This was because the ability of households in this cluster to secure non-farm employments was based on their level of education rather than personal contacts or any other components of social capital. Their greater proximity to rural town centers, had also contributed to the households' greater participation in non-farm employment.

The distinguishing feature of cluster 4, farming, and non-farm employment, which represented 20 percent of the sampled households, was their largest size of cultivated area of about 2.4 hectares. This was reflected in the greater reliance on farm income as the main source of income. Although the size of cultivated land is higher compared to those in cluster 1, the contribution of farm income to total household income was much lower to those in cluster 1. Another comparable cluster was households in cluster 2, which had about the same contribution of farm income (66 percent) in total household income but with a much smaller size of cultivated land.

Table 5.24: Summary statistics of household assets by livelihood strategies

Variable	Total sample (N = 359)		Cluster 1 (N = 162)		Cluster 2 (N = 59)		Cluster 3 (N = 68)		Cluster 4 (N = 70)	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Human capital										
Age of household head (years)	52	10.924	52	11.416	53	10.514	52	10.330	53	9.64
Number of household members	4.06	1.683	4.10	0.918	4.22	1.733	4.97	1.611	3.91	1.576
Number of dependents	1.11	1.253	1.56	0.103	1.35	1.297	1.21	1.126	1.83	1.209
Number of working members	2.98	1.301	2.54	0.102	2.87	1.231	3.76	1.423	2.08	1.268
Average education of working members (years)	9.54	5.950	7.16	2.616	9.17	2.183	10.93	12.70	9.39	2.182
Natural capital										
Total cultivated area (hectares)	2.09	1.258	2.27	1.257	1.85	1.237	1.54	0.874	2.40	1.410
Percentage of land owned	65.43	40.13	65.87	37.78	58.48	46.10	71.54	40.97	64.31	39.101
Financial capital										
Share of other non-farm income (%)	3.80	8.697	1.29	3.868	4.25	6.582	6.38	11.647	6.71	12.632
Physical capital										
Value of equipment (Ringgit)	5410.89	3618.10	4840.91	3087.92	6560.25	3947.15	5275.29	5892.97	4488.86	4090.127
Social capital										
Social capital index	86.93	9.521	86.41	8.878	88.56	9.358	75.57	7.918	88.10	12.074
Locational capital										
Time taken to reach rural town (minutes)	24.62	5.236	28.44	5.299	24.49	4.900	20.49	4.494	27.57	4.983

Note: Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment.

The mean educational years of working members in cluster 4 was higher compared to those in cluster 1. This had enabled households in this cluster to participate in non-farm employment, hence a greater contribution of non-farm labor income of 25 percent compared to those in cluster 1. About 29 percent of the households had at least one household member in agricultural-wage employment. This had been made possible partly by the types of farm implements they own. Households in cluster 4 had the lowest mean value of farm implements owned (RM4,489). The types of farm implements were the same as those in cluster 1 and were mostly for the farm's own use. Although, households in cluster 4 had a lower proximity to rural centers the differences in terms of the time taken to reach the rural towns does not affect the households' participation in non-farm employment that were available in nearby rural towns.

5.4.2 Analysis of livelihood strategies

Evidence from the characterization of livelihood strategies in section 5.4.1 indicated that livelihood strategies that were associated with non-farm employment (clusters 3 and 4) provided households with a higher income. However, the number of households selecting these strategies was low with 19 percent for cluster 3 and 20 percent for cluster 4 compared to those selecting cluster 1, which is the "highly specialized in farming" cluster (45 percent). What were the barriers that prevented households from adopting these high-return livelihood strategies? To address this issue, the rural households' choice of livelihood clusters, as discussed above will be utilized. The choice of a livelihood strategy is a polychotomous choice variable, hence a multinomial logit (MNL) regression was used to explain the households' choice of a livelihood strategy (Greene, 2008). Results of the MNL regression were shown in Table 5.25, with cluster 1 (highly specialized in farming) as the reference category. Overall, the model was 64 percent accurate in predicting the selected livelihood strategies. More specifically, households participating in cluster 1 were predicted most accurately (88

percent). This was followed by the accuracy of predictions for households in specialization in non-farm employment (cluster 3) with 60 percent accuracy; farming and non-farm employment (cluster 4) with 38 percent accuracy and finally for households in the farming and agricultural-wage employment (cluster 2) with the lowest accuracy of 31 percent.

The factors that were used in the model were the variables representing each of the household asset categories. Human capital variables include age of household head, household size, number of dependents and number of working members as these variables will determine the availability of labor, and the average education of working members. Natural capital was represented by the amount of cultivated land (including owned, rented land and land under share-cropping arrangement) as more cultivated land would increase crop production, percentage of land owned by household and dummy variables representing categories of total cultivated land size - Land_cat1 (0.01 – 0.99 ha); Land_cat2 (1.0 – 1.99 ha); Land_cat3 (2.0 – 2.99 ha); and Land_cat4 (> 3.0 ha). Physical capital in terms of value of equipment owned was included as it may influence a household's participation in agricultural-wage employment. Other variables include a social capital index, locational capital, which was represented by the time taken to reach a rural town as well as dummy variables representing areas, and finally, financial capital was represented by access to credit and the share of other non-farm income.

The mean for household asset variables were found to be significantly different at the 0.05 level of significance between livelihood clusters, established by the Games-Howell test. This test is suitable for pair-wise multiple comparisons between groups in case of unequal variances between groups and unequal group sizes (Cardinal & Aitken, 2005; Field, 2011). The Levene's statistic which is a test for homogeneity of variances was significant for a majority of the variables included in the cluster analysis. This means that there was a significant difference between the variances of the different

clusters. The F-test of ANOVA was not robust because of the differences in cluster sizes; hence the tests of mean differences of household asset variables among livelihood clusters were also carried out using the Games-Howell test that do not assume equal variances between groups.

The estimated coefficients from the MNL regression represent the effect of each variable on the ratio of the probability of a household selecting cluster 1 (highly specialized in farming strategy), which was the most common livelihood strategy among households in the study areas. The regression coefficients were not used to compute the marginal effects of the explanatory variables on the selection of a livelihood cluster. This is because the results are not always interpretable as suggested by Kimhi (2007). The explanatory variables include dummy variables such as having borrowing experience (CREDIT), household location (AREA) and cultivated land size categories. These variables can only be changed from zero to one; hence the marginal effects based on percentage changes are meaningless.

In general, households with a large size of cultivated area are less likely to choose a diversified livelihood. In particular, the results showed that the size of cultivated area per adult equivalent (LandSize) and having a cultivated land size of between 0.01 and 0.99 ha (Land_cat1) as well as between 1.00 and 1.99 ha (Land_cat2) were common significant determinants in the selection of a diversified livelihood strategy.

Table 5.25: Determinants of livelihood strategies (multinomial logistic regression)[a]

	Cluster 2			Cluster 3			Cluster 4		
Variable	**B**	**Std. Error**	**Exp(B)**	**B**	**Std. Error**	**Exp(B)**	**B**	**Std. Error**	**Exp(B)**
AGE	0.02	0.18	1.02	-0.12	0.32	0.89	0.01	0.02	1.01
HSIZE	0.05	0.19	1.05	0.37	0.15	1.44**	0.26	0.19	1.30
WLabor	0.88	0.79	1.08	0.35	0.12	1.34**	0.17	0.48	1.18
DEPENDENTS	-0.32	0.25	0.73	-0.06	0.23	0.94	-0.08	0.22	0.92
EDU	-0.27	0.28	0.76	0.36	0.17	1.43**	0.27	0.43	1.31
LandSize	-0.08	0.03	0.92**	-0.19	0.06	0.83**	-1.28	0.27	0.25**
LandOwned	-0.12	0.11	0.89	-0.09	0.57	0.92	-0.15	0.59	0.86
Cultivated land category[a]									
Land_cat1	3.17	1.67	23.81**	4.15	2.18	63.43**	3.51	2.14	33.45**
Land_cat2	2.13	1.13	8.41**	3.25	1.83	25.79**	2.61	1.61	13.60**
Land_cat3	-2.43	1.73	0.09	-2.18	1.87	0.11	-2.13	1.95	0.12
Land_cat4	-1.73	1.62	0.18	-1.59	1.18	0.20	-1.22	1.15	0.30
ONFY_share	0.02	0.01	1.02**	0.03	0.25	1.03	0.49	0.23	1.63**
CREDIT	1.14	0.46	3.12**	0.75	0.61	2.11	1.03	0.47	2.80**
EQUIP	0.33	0.15	1.39**	-0.04	0.50	0.97	-0.08	0.45	0.93
SC	1.13	0.87	8.44	0.11	0.27	1.12	0.03	0.04	1.03
DTIME	-0.07	0.89	0.93	-0.28	0.74	0.75	-0.18	0.83	0.85
AREA	0.05	0.41	1.05	0.16	0.44	1.18	-0.14	0.40	0.87

Pseudo R-Squared	.578
Percent correctly predicted	63.69%

Note: Cluster 1: Highly specialized in farming; Cluster 2: Farming and agricultural-wage employment; Cluster 3: Specialization in non-farm employment; and Cluster 4: Farming and non-farm employment. The reference category is cluster 1.

[a] Cultivated land category: Land_cat1 = 0.01 – 0.99 ha; Land_cat2 = 1.00 – 1.99 ha; Land_cat3 = 2.00 – 2.99 ha; and Land_cat4 = more than 3.00 ha.

**Significant at 0.05 level

The LandSize variable had an exponentiated coefficient (Exp (B)) value of less than 1 which means that for any positive change in the size of cultivated land will significantly decrease the odds of selecting livelihood clusters 2, 3, and 4 compared to cluster 1, which was highly specialized in farming. However, this is only observed for households with a cultivated land size of more than 2 hectares, where the negative effect was not found to be significant. On the contrary, having a cultivated land size of less than 2 hectares will significantly increase the probability of choosing a diversified livelihood cluster. The negative coefficients for both LandSize and LandOwned were as expected as these provided support that households with a larger land size will be less likely to choose a diversified livelihood strategy.

In addition to the common factors discussed above, the selection of a livelihood that combines farming with agricultural-wage employment (cluster 2) were also significantly affected by the share of other non-farm income, having borrowing experiences and the value of their farm implements. All of these variables had positive coefficients and Exp (B) values of greater than 1, which imply an increase in the odds of choosing cluster 2 or a reduction in the probability of choosing cluster 1 with any increase in these variables. As an example, the odds of a household selecting livelihood cluster 2 will increase by a factor of 3 for households with borrowing experiences compared to those who do not have such experience. The value of farm equipment owned had the greatest effect on the odds of selecting cluster 2 with the odds increasing by 39 percent with a percentage change in the value of farm equipment owned by households. In contrast, each additional percentage increase in LandSize reduced the odds of choosing this livelihood by 8 percent.

The odds of selecting a livelihood that is based on specialization in non-farm employment (cluster 3) was also affected by household size and number of working members in addition to average education of working members. In particular, the odds

of a household selecting livelihood cluster 3 will increase by 43 percent for each additional year of education; 44 percent for each additional increase in household size per adult equivalent; and 34 percent for each additional increase in the number of working members. Each additional percentage increase in the size of cultivated land per adult equivalent, however, had a decreasing effect of 17 percent on the odds of choosing a livelihood that was based on specialization in non-farm employment. Household size and education of working members also had a positive significant effect on the probability of selecting livelihood cluster 3. The importance of education was also highlighted by Stifel (2010) where households with higher education tend to choose a livelihood cluster that was based on only non-farm activities or a combination of non-farm activities and farming. Brown et al. (2006) and Iiyama et al. (2008) have also found that higher education is associated with a diversified high-return livelihood strategy.

The small size of cultivated land per adult equivalent for households in cluster 3 suggests that these households were pushed into participation in non-farm employment. This was consistent with the findings by Zhu and Luo (2006) for households in rural China. The higher average education also indicated that these households were also pulled into non-farm employment because having higher education had enabled them to overcome the barriers into higher return non-farm employment. Therefore, for households in cluster 3, their participation in non-farm employment were due to the combination of pull and push factors.

As with cluster 2, the odds of selecting a livelihood that combined farming and non-farm employment (cluster 4) was affected by significant variables such as the share of other non-farm income, and having borrowing experiences, in addition to the size of cultivated area, in particular having a size of cultivated area of less than 2 hectares. Among these variables, the size of cultivated land per adult equivalent had the greatest

negative effect in the selection of cluster 4 with the odds decreasing up to 75 percent especially for households with a land size category of between 0.01 and 0.99 ha. This was because households in this livelihood cluster earn 66 percent of their total income from farming. As a consequence, an increase in the size of total cultivated area will significantly decrease the odds of choosing this cluster. Other important variables with a positive effect of increasing the odds of selecting cluster 4 were the share of other non-farm income with 63 percent and having borrowing experiences (by a factor of 2.8). These factors were significant to the selection of this livelihood cluster as households are also involved in non-farm self-employment. Having borrowing experiences had enabled households to obtain funding.

The negative effect of LandSize on the selection of a diversified livelihood was also observed by Stifel (2010) for Madagascar where households with small and large landholdings had been found to adopt a livelihood strategy that combined farming and non-farm employment as with households in clusters 3 and 4. Households in cluster 3 had the lowest average cultivated land (1.54 hectares) while households in cluster 4 had the highest average cultivated land (2.4 hectares) which was even higher than the average cultivated land of households in cluster 1. Households in cluster 4 may be able to hire labor to carry out work on the farm hence relieving them for non-farm jobs.

The positive effects of having borrowing experience and the share of other non-farm incomes were observed in the probability of choosing a livelihood cluster that combined farming and agricultural-wage employment (cluster 2) as well as farming and non-farm employment (cluster 4). The ability of these households to diversify into these activities was due to their higher liquidity from their borrowing experiences and higher share of other non-farm incomes. This finding was also consistent with the findings by Barrett et al. (2005), Brown et al. (2006) as well as Dercon and Krishnan (1996) on the importance of financial liquidity to livelihood choice.

Social capital as represented by the social capital index had a positive effect on the selection of all three livelihood strategies compared to cluster 1; however, the effect was not significant. The positive effect implied that an increase in the index of social capital will increase the probability of choosing livelihood clusters 2, 3, and 4 while decreasing the probability of choosing livelihood cluster 1. This was because securing employment in someone's else's farm, either as a hired labor or providing agricultural services to other farmers, required some level of networking which included trust and the availability of information. The greater the level of networking, the greater was the probability of being employed especially in agricultural-wage activities and non-farm self-employment.

The value of farm implements owned by farm households was another household asset that was found to be not significant in the selection of a livelihood strategy that combined farming and non-farm activities (clusters 3 and 4). This variable had a negative effect on the probability of choosing cluster 3 (specialization in non-farm employment) and cluster 4 (farming and non-farm employment) compared to cluster 1 (highly specialized in farming). On the other hand, the value of farm equipment owned decreased the probability of choosing cluster 1 compared to cluster 2 (farming and agricultural-wage employment). With greater farm equipment households had greater opportunities for participating in agricultural-wage employment, which will reduce the probability of being highly specialized in farming.

5.5 Summary of findings

This chapter presented the results of the descriptive analysis of income and activities as well as the determination of factors influencing activity choice and incomes introduced in the conceptual framework. Farming was still the most important source of income for rural households in the study area contributing, on average, about 67 percent

to total household income. The remaining 33 percent of the share came from agricultural-wage employment and non-farm activities indicating their importance in total household income. About 71 percent of the households had been found to have more than one income source. Distinguishing between income groups it was observed that non-farm activities were important to the high and medium income groups.

The MNL model showed that there were entry barriers to the selection of the most remunerative livelihood cluster (cluster 3). Different livelihood strategies had significant implications for household income. The results from the cluster analysis confirmed that households that adopt a livelihood strategy that combined farming and non-farm work earn significantly higher incomes than do full-time farming households. The results also underscore the well documented situations of heterogeneous determinants of diversification among rural households. In analyzing activity choice it was found that the size of cultivated land, the share of other non-farm incomes, borrowing experience, and value of equipment owned had a significant effect on the selection of a livelihood cluster that combined farming and agricultural-wage employment.

In choosing a livelihood cluster that involved specialization in non-farm employment the significant factors include household size, number of working members, average education of working members, and size of cultivated land, in particular having a cultivated land size of less than 2 hectares. In addition to the size of cultivated area, household selection of a livelihood cluster which combined farming and non-farm employment include the share of other non-farm incomes and borrowing experience.

CHAPTER 6

FINDINGS FROM THE ANALYSIS OF INCOME AND INCOME DISTRIBUTION

6.1 Introduction

Analyzing the determinants of total household income and of income from other sources can further enhance the understanding of the potentials and constraints for households to benefit from specific activities. The results of the analyses on household incomes were presented in this chapter. The estimated coefficients were then used in analyzing the effect of each household asset on income distribution. The focus of this chapter will first be on the findings based on the whole sample in order to establish an overall picture of rural income generation among the sampled households in the study areas. This is followed by the presentation of the results from the analyses of the determinants of household incomes by livelihood clusters.

The previous chapter only provided a partial analysis of income and activity choice. Therefore, this chapter explores the causal relationships between household asset variables and incomes. More specifically, the effects of the previously described factors on household incomes were analyzed in the following sections. In analyzing the determinants of total household income and income from other sources the ordinary least square (OLS) and Tobit regressions were used. Since all households earned an income and were involved in farming, hence earning farm income, the equations for these two income categories were estimated by OLS. The other income categories – agricultural-wage, non-farm wage and non-farm self-employment incomes – were estimated using Tobit regression because not all households earn these incomes. Households who do not participate in an activity will obtain zero income from such activity. Therefore, a censored equation model, i.e. Tobit regression, was applied

instead. In each of the models, log percapita income was regressed on a set of household assets. A common set of household assets was used in both the OLS and Tobit regressions to identify the determinants of income levels and income shares. This was to enable the comparisons of the effects of the variables between models. These assets had also been used in the MNL regression as it is likely that factors affecting the probability of choosing a specific activity would also determine the level and share of incomes from the selected activities.

6.2 The determinants of household income

6.2.1 Analysis of household income level

The income regressions in Table 6.1 explain log income percapita as a function of household assets. The semi-log functional form is appropriate because it facilitates the decomposition of inequality and because the logarithmic transformation eliminates the skewness of the income variables (Naschold, 2009). The results of the OLS and Tobit analyses of income levels for the whole sample are as shown in Table 6.1 and will be used to test hypotheses 2 through 7. Most coefficients were found to have the expected signs. In general, an increase in household size per adult equivalent, total cultivated area, and social capital had been found to have a positive significant effect on increasing both percapita household income and percapita farm income. In addition to these variables, the number of working members, the average education of working members and household location also had positive significant effects on percapita income, while the percentage of land owned, value of farm equipment owned and having borrowing experience were additional positive significant factors to farm income.

Among some households the age of household head had a non-linear effect on total household income by first being negative and subsequently positive. This is not a

common result in previous studies. It may be due to the fact that income from non-labor income sources is increasing with age of the household head. It may also be due to the greater contribution of labor income from young household members to total household income. This was also observed by Arayama et al. (2006) for Korea and Kimhi (2007) for farm households in Georgia. The selected explanatory variables and the model specification were able to explain about 38 percent of the variations in percapita income (R^2 value of 0.3785) and 56 percent of the variations in percapita farm income (R^2 value of 0.5586).

Household size reflects the availability of labor. The greater the household size, the greater the number of labor that can be allocated to other income generating activities. Household size had a positive effect on income in all equations; however, the effect was significant for percapita farm and non-farm wage incomes. An increase in the size of a household by 1 adult person will result in a 16.4 percent and 14.5 percent increase in percapita household farm income and percapita non-farm wage income, respectively. This was not surprising because the greater the household size, the greater the labor supply hence, the greater the number of workers to be allocated to both farm and non-farm activities. The positive effect of household size on household income had also been observed by Jansen et al. (2006) and Babulo et al. (2008) for households in Honduras and Ethiopia, respectively. The number of dependents had a negative effect on the level of all income sources except for percapita farm income. This means that the higher the number of dependents the lower was the participation in income generating activities hence a lower level of percapita income.

Results in Table 6.1 suggest that households with more working members were more likely to participate in non-farm activities. Households with smaller cultivated land will have low labor productivity in farming. Other things being equal, a larger household with a higher number of working members will have a lower opportunity

cost of having some of its members working outside of farming. This was shown by the positive significant effect of number of working members for agricultural-wage income ($z = 6.171$, $p < 0.05$) and non-farm wage income ($z = 3.091$, $p < 0.05$). However, the number of working members had a significant negative effect on non-farm self-employment income ($z = -3.573$, $p < 0.05$). Part of the reason may be non-farm self-employment activities require more start-up capital and entrepreneurship. Furthermore, only 9 percent of the households were capable and willing to run their own businesses. The participation of dependent persons who can partially participate in some non-farm work of the household such as working in restaurants, accommodation, and food processing was important to a household's participation in non-farm self-employment. The contrasting effect of the number of working members on agricultural-wage and non-farm self-employment incomes may also indicate a possible substitution between agricultural-wage employment and non-farm self-employment. This finding proofs the hypothesis that the number of working-age labor had a significant positive effect on the level of non-farm wage income (H_3). This finding was also consistent with findings by most studies including those by Zhu and Luo (2006), Abdul Malek and Usami (2009), as well as Abdulai and CroleRees (2001).

It was not surprising to find a significant negative effect of education on percapita farm and agricultural-wage incomes. Davis et al. (2007) have found a negative significant effect of education on household participation in agricultural-wage employment hence significantly decreasing the level of agricultural-wage income. In addition, agricultural-wage employment may be a refuge employment for rural households especially for the low income households with relatively low levels of average education for their working members.

Higher educational years will enable households to participate in higher paying non-farm employment opportunities, especially in non-farm wage employment. This was also observed by De Janvry and Sadoulet (2001) for rural Mexico. The importance of average education of working members was apparent in the percapita non-farm wage income model. This was shown by the positive significant effect of the average education of working members for non-farm wage income. A 1 year increase in the average education of working members will increase percapita non-farm income by 15 percent. The significant effect of education on non-farm wage income suggested that the entry barriers in terms of education were higher for wage-paying activities. Part of the reason was that it was easier for the better educated rural households to find a non-farm job. Based on this finding, the study was able to provide proof to hypothesis 2 that the average education of working members does have a significant positive effect on the level of non-farm wage income ($z = 7.364$, $p < 0.05$). This finding was also consistent with findings from most studies such as those by Davis et al. (2007), Lay et al. (2009), Escobal (2001), De Janvry and Sadoulet (2001), and De Brauw et al. (2002).

Interestingly, the percentage of land owned had a statistically insignificant association with the level of income in all specifications, except for the farm income equation. This suggested that greater land ownership alone was not a guarantee for higher income. Nevertheless, the percentage of owned land does affect income, though indirectly, through its effect on livelihood strategies. Total cultivated area, however, had a significant positive effect on percapita income ($t = 8.033$, $p < 0.05$) and farm income ($t = 2.344$, $p < 0.05$). This was because farming was the main income-generating activity for a majority of the households (about 53 percent) in the granary area and farm income contributes up to 67 percent to total household income (Table 5.5). A 1 hectare increase in the size of cultivated land through rental, ownership, share-cropping, or any

combination of the three production arrangements, will significantly increase total income by 14 percent and farm income by 13 percent.

Table 6.1: Determinants of percapita income

Variable	OLS		Tobit		
	Total income (log)	**Farm income** (log)	**Agricultural-wage income** (log)	**Nonfarm wage income** (log)	**Non-farm self-employment income** (log)
C	1.858**	2.329**	-4.701**	-5.644**	-16.381**
	(8.518)	(4.474)	(-3.502)	(-4.506)	(-2.746)
AGE	0.003**	0.169	0.016	0.010	0.021
	(3.430)	(1.539)	(0.698)	(0.333)	(0.085)
AGE^2	-0.035	-0.001	-0.014	0.010	-0.008
	(-0.775)	(-0.435)	(-0.643)	(0.309)	(-0.068)
HSIZE	0.242**	0.164**	0.037	0.145**	0.114
	(6.592)	(4.320)	(0.348)	(2.414)	(0.244)
WLabor	0.056**	0.035	0.190**	0.096**	-0.031**
	(6.888)	(0.591)	(6.171)	(3.091)	(-3.573)
DEPENDENTS	-0.063	-0.027	-0.038	-0.058	-0.169
	(-1.282)	(-1.181)	(-0.391)	(-0.454)	(-0.516)
EDU	0.055**	-0.140	-0.171**	0.153**	0.028
	(2.115)	(-1.647)	(-1.361)	(7.364)	(0.073)
LandSize	0.141**	0.132**	-0.145**	-0.058	-0.046
	(8.033)	(2.344)	(-3.201)	(-0.749)	(-0.211)
LandOwned	0.113	0.101**	-0.021	-0.001	-0.003
	(0.033)	(3.034)	(-1.029)	(-0.611)	(-0.922)
ONFY_share	0.004	0.011	-0.015	-0.066	0.091
	(0.560)	(0.033)	(-0.289)	(-0.153)	(0.543)
CREDIT	0.035	0.091**	0.110	0.090	0.073**
	(1.347)	(2.118)	(1.043)	(0.122)	(3.031)
EQUIP	0.022	0.060**	0.030**	-0.004	-0.025
	(1.571)	(2.869)	(9.082)	(-1.611)	(-1.800)
SC	0.016**	0.024**	0.057**	0.014	0.097**
	(3.556)	(3.093)	(5.277)	(1.868)	(2.901)
DTIME	-0.032	-0.053	-0.047	-0.030	-0.129
	(-1.305)	(-1.755)	(-0.595)	(-0.450)	(-0.428)
AREA	0.210**	0.003	-0.184**	0.987**	0.020**
	(8.118)	(0.124)	(-2.262)	(5.040)	(3.936)
R^2	0.3785	0.5586			
Log likelihood			-194.866	-126.205	-98.327
Left censored observations			229	245	328

Notes: ** significant at 5% level. The t-values for OLS regression and z-values for Tobit regression are in brackets.

As farm income was a component of total household income, hence the significance of total cultivated land on total household income. This variable, however, had a negative but not a significant effect on non-farm wage income (z = -0.749, p < 0.05). The same effect was also observed for the proportion of land owned (z = -0.611, p < 0.05). This finding provides proof for the hypothesis that the size of cultivated land has a negative effect on the level of non-farm wage income (H_4). This suggests that non-farm wage income is not linked to the size of cultivated land or land ownership; hence it is more important to the low income households. This is consistent with the findings by Adams (2001) for rural Egypt as well as by Corral & Reardon (2001) for Nicaragua, where the negative effect of land owned also implied that land produced income that was a substitute for non-farm income.

In terms of the effect of the value of farm equipment on total household income, for every 1 percent increase in the value of equipment owned; total household income will increase by 2 percent and by 6 percent for total farm income. Having farm equipment will reduce the cost of paddy production as this equipment was used by farmers for land preparation, crop management, and irrigation, hence increasing farm profits. Moreover, the value of farm equipment was positively significant to farm and agricultural-wage incomes.

The availability of credit had a positive significant effect on percapita farm income (t = 2.118, p < 0.05) and non-farm self-employment income (z = 3.031, p < 0.05). This finding proves that having access to credit had a positive significant effect on the level of non-farm self-employment income (H_5). Having the ability to borrow funds was significant as it enabled farmers to purchase inputs for their paddy production and to households with self-employment activities as a form of capital for their businesses. This was consistent with the findings by Berdegué et al. (2001) and Escobal (2001).

Social capital had a positive significant effect on all activity incomes – farm income (t = 3.093, $p < 0.05$), agricultural-wage income (z = 5.277, $p < 0.05$), and non-farm self-employment income (z = 2.901, $p < 0.05$) except for non-farm wage income (z = 1.868, $p < 0.05$). This finding proves that social capital does have a positive significant effect on the level of income from agricultural-wage employment and non-farm self-employment (H_6). This finding was also consistent with the findings by Nega et al. (2007). The significant influence may be due to the greater correlation of each of the social capital components with the respective income sources as shown in Table 5.17. Examples of the social capital component include level of trust, household exposure to information and household participation in various formal and informal groups, which opened up greater opportunities in agricultural-wage employment.

The significant locational factor was household location in Panchang Bedena. Households located in this area had been found to have a positive significant effect on non-farm wage employment income (z = 5.040, $p < 0.05$) and non-farm self-employment income (z = 3.936, $p < 0.05$) but a negative significant effect on agricultural-wage income (z = -2.262, $p < 0.05$). This finding provides proof for the hypothesis that household location in Panchang Bedena had a positive significant effect on the level of income from non-farm wage employment and non-farm self-employment (H_7). This may also imply a possible substitution between participation in agricultural-wage employment and non-farm self-employment among households in Panchang Bedena. The finding was also observed by Davis et al. (2007) where households who were located farther away from urban centers tend to participate in farming and agricultural-wage employment as these activities were located farther away from town centers.

Rural entrepreneurs residing in Panchang Bedena had greater advantage in their businesses because of the existence of the local rural town of Sungai Besar and were

closer to other nearby rural towns in the area. Households who were self-employed in the non-farm sector often have their own businesses such as grocery stores, accommodation and restaurants or food stalls, snack food processing establishments, automotive workshops, and transportation service providers. These businesses mostly serve the local consumers, hence the greater the time that it takes for the locals to find alternatives to these local businesses, the higher the potential profit to these businesses.

6.2.2 Analysis of household income share

The analysis of the determinants of income shares for the four income sources (Table 6.2), revealed some similarities and differences in the significant variables when compared with the analysis for income levels. Household size had a positive effect on the share of income from all income sources. However, the effect was significant on the shares of farm income ($t = 3.297$, $p < 0.05$), agricultural-wage income ($z = 2.230$, $p < 0.05$) and non-farm wage income ($z = 3.290$, $p < 0.05$). The proportion of farm income will increase by about 15 percent with a 1 adult person increase in household size. This same increase in household size also significantly increased the share of incomes from agricultural-wage and non-farm wage employment by about 3 percent and 6 percent, respectively, as more labor were allocated to these types of employment. Another significant variable affecting income shares was the average education of working members. The significant negative effect for farm income share means that for a 1 year increase in the average education of this group of household members, the farm income share will decrease by about 7 percent. This was due to the fact that the higher the education the greater was the ability of household members to participate in activities other than those on their own farms. This is reflected in the significant positive effects ($z = 3.975$, $p < 0.05$) of 17 percent for non-farm wage employment and 1.6 percent for agricultural-wage income. The effect of higher education was more significant on non-farm wage income as these constitute more remunerative activities.

The size of cultivated area naturally affects the level of farm income, hence the share of income from farming. The significant positive coefficient for total cultivated area (t = 3.832, $p < 0.05$), implied that for a 1 hectare increase in total cultivated area per adult equivalent, the share of farm income will increase by 17 percent. However, this also caused a 3 percent significant decrease in the share of non-farm wage employment income. The size of cultivated land also had a negative effect on the share of agricultural-wage and non-farm self-employment incomes, though the effects were not significant. This was because the size of cultivated land had a significant positive effect on the level of farm income, hence the significant contribution of this variable to the share of farm income.

Household borrowing experience and the share of other non-farm income had a positive effect on the share of all income sources. However, the effect of credit was positively significant in both farm income (t = 2.621, $p < 0.05$) and non-farm self-employment income (z = 2.208, $p < 0.05$). The share of other non-farm income was positively significant only in the farm income share.

The value of equipment owned, which had a positive significant effect on the level of agricultural-wage income, also had a positive significant effect on the share of this income category in total household income. As shown by the coefficient for this variable, a 1 percent increase in the value of farm equipment owned per adult equivalent will increase the share of agricultural-wage income by 5.24 percent. Having greater farm implements means that farm households were able to provide agricultural services to other farmers in the area hence increasing their share of income from agricultural-wage employment. There was also a positive effect of this increase on the share of farm income although the effect was not significant. This was because farm equipment was part of a farm household's input in paddy production.

Table 6.2: Determinants of household income shares

Variable	OLS	TOBIT		
	Farm income	Agricultural-wage income	Nonfarm wage income	Non-farm self-employment income
C	7.531**	-3.470**	-2.643**	-5.031**
	(2.638)	(-2.403)	(-2.514)	(-3.171)
AGE	0.018	-0.087	-0.204	-0.076
	(0.185)	(-0.611)	(-0.695)	(-0.185)
AGE^2	-4.918	-3.304	2.699	9.597
	(-1.930)	(-0.855)	(0.414)	(0.841)
HSIZE	15.237**	2.941**	5.801**	5.623
	(3.297)	(2.230)	(3.290)	(0.273)
WLabor	6.037	2.978	5.956**	2.855
	(1.261)	(0.414)	(2.564)	(1.457)
DEPENDENTS	-0.417	0.837	-0.600	-6.583
	(-0.183)	(0.261)	(-0.093)	(-0.567)
EDU	-6.558**	1.617**	17.325**	1.125
	(-2.685)	(3.877)	(3.975)	(0.577)
LandSize	16.922**	-4.719	-2.589**	-2.984
	(3.832)	(-0.716)	(-2.553)	(-1.568)
LandOwned	1.135**	-0.063	0.038	-0.172
	(2.667)	(-1.584)	(0.496)	(-1.439)
ONFY_share	6.889**	0.293	1.773	0.675
	(5.537)	(0.152)	(1.163)	(0.048)
CREDIT	6.626**	6.991	1.165	2.515**
	(2.621)	(1.718)	(1.657)	(2.208)
EQUIP	0.040	5.244**	-0.329	-0.320**
	(0.620)	(2.384)	(-1.688)	(-2.148)
SC	0.017	0.329**	0.421	0.948
	(0.159)	(2.070)	(1.480)	(1.944)
DTIME	-5.752**	-1.649	-1.024	-3.145**
	(-3.054)	(-0.560)	(-0.507)	(-2.759)
AREA	5.068	3.500	3.558**	9.572**
	(1.593)	(1.007)	(3.492)	(3.030)
R-squared	0.4295			
Log likelihood		-715.315	-679.923	-223.051
Left censored observations		229	245	328

Notes: ** significant at 5% level. The t-values for OLS regression and z-values for Tobit regression are in brackets.

Owning farm equipment will enable farmers to reduce their cost of production, which translates into higher farm profits for the households. In addition, paddy farmers also receive subsidies for the cost of land preparation hence also reducing the cost of paddy production. In contrast, the 1 percent increase in the value of farm implements had a significant negative effect on the share of non-farm self-employment income (z = -2.148, $p < 0.05$), which again may suggest a possible substitution between agricultural-wage employment and non-farm self-employment. Having these farm equipment means that households do not have to participate in non-farm employment, hence decreasing the proportion of non-farm wage and self-employment incomes. This finding was also observed by Berdegué et al. (2001) in analyzing the effect of ownership of equipment on income shares in rural Chile.

Social capital had a positive effect on the share of all income sources but the effect is only positively significant (z = 2.070, $p < 0.05$) on the share of income from agricultural-wage employment. Furthermore, social capital has been shown to have a positive significant effect on the level of income from farm income, agricultural-wage income and non-farm self-employment income. As discussed previously, social capital was one of the important factors in securing agricultural-wage employment opportunities.

The length of time taken by a household to reach the closest rural town, which offers greater non-farm employment opportunities, had a negative effect on the share of income from all income sources. However, the negative effect was significant on the share of farm and non-farm self-employment incomes. The greater the travel time, the lesser will be the time available for farming. On average, a household spends about 3.5 hours a day in the paddy fields, especially for crop management. With the increase in travel time, they would have to reduce the time spent on farming, especially in crop management, hence may result in lower yield. For households who can afford to hire

labor, this would represent an increase in the cost of production, which would translate into lower farm profits, hence reducing the income share from farming. The same increase in travel time also had a negative effect on the share from the other three income sources. However, as with the share of farm income, the negative effect was significant for the share from non-farm self-employment income. This was because as the travel time to rural town increased, rural entrepreneurs would have some difficulty marketing their goods and services outside of their locality. The negative effect of travel time on the share of non-farm wage income was not found to be significant because about 98 percent of the households have their own transportation which had enabled them to have access to non-farm wage employment opportunities.

Another significant determinant to the share of non-farm income was household location in Panchang Bedena which had a significant positive effect on the shares of incomes from non-farm wage and non-farm self-employments. As previously discussed, household location in Panchang Bedena had a significant effect on the level of both types of non-farm incomes due to their greater access to non-farm employment opportunities compared to those located in Bagan Terap. This had also contributed to the significant positive effect of location on the shares of both non-farm income sources. This was consistent with the findings from Lay et al. (2009), Corral and Reardon (2001), as well as Ferreira and Lanjouw (2001).

6.3 Analysis of income distribution

6.3.1 Inequality decomposition by income source

This section presents the results of the analysis on rural income inequality by income sources. Table 6.3 shows the details of the Gini decomposition of percapita household income for all households in the sample. The Gini coefficient for overall income inequality that included non-farm income is 0.400, which was lower than the

overall Gini coefficient of 0.441 for Malaysia and the rural Gini coefficient of 0.407 for 2009, as reported in the 10th Malaysia Plan. However, without non-farm income sources the Gini coefficient for overall inequality was even lower with 0.382. This indicates that non-farm income had caused overall inequality to increase by 4.71 percent. Another way of determining the effect of non-farm income on overall inequality was through the use of overall inequality and farm income inequality. An overall Gini coefficient of 0.400 and a farm income Gini coefficient of 0.384 suggest that without non-farm income, the distribution of total household income would have been 4 percent less unequal. In other words, the presence of non-farm income had increased rural inequality. This was in contrast to the study by De Janvry et al. (2005) for China where the Gini index was found to be higher without non-farm income.

The decomposition of the overall Gini coefficient provides two ways of measuring the contribution of an income source to overall income inequality. First, it enables the determination of the contribution of each income source to total income inequality. Second, it will also enable the determination of the effect of inequality in an income source in increasing or decreasing overall income inequality.

Table 6.3 shows that farm income was the largest contributor to overall income inequality, with a contribution of about 59 percent. However, a uniform 1 percent increase in farm income decreased inequality by 8 percent. In contrast, the contribution of non-farm income to overall income inequality was only 36 percent but a uniform 1 percent increase in non-farm income caused inequality to increase by about 10 percent. This indicates that non-farm income was an inequality-increasing source of income while farm income was an inequality-decreasing source of income.

The larger contribution of farm income to overall inequality was also observed by De Janvry and Sadoulet (2001) for rural Mexico and Adams (2001) for rural Egypt.

The smaller contribution of non-farm income to income inequality compared to the contribution by farm income was partly due to the smaller share of non-farm income in total rural income (S_k), which was only about 26 percent, compared to the larger share of farm income (67 percent). Moreover, the correlation of source income with total income rankings (R_k) for non-farm income was lower (0.726) than that for farm income (0.920). However, the pseudo Gini (G_k) for non-farm income (0.759) was higher than that for farm income (0.382); this shows that non-farm income was more unequally distributed than farm income. The greater contribution of non-farm income to inequality compared to its share in total household income as well as its low correlation with total income had caused non-farm income to be an inequality increasing source of income. This was also observed by Van den Berg and Kumbi (2006) for Ethiopia.

Percapita agricultural-wage income had the lowest correlation with total inequality (R_k) with a correlation coefficient of 0.386, smallest income share of about 7 percent and the highest pseudo Gini (0.795). This means that agricultural-wage income is the most unequally distributed income source. Among the disaggregated income sources in percapita farm income, income from paddy cultivation had the highest value for Gini correlation of 0.876, which represents the correlation between paddy income source and the distribution of percapita household income. In the non-farm income category, non-farm wage income had the highest correlation of 0.710, followed by self-employment income (0.643). Income from paddy cultivation was the most equally distributed income source, while for other income sources their distributions were more unequal. These income distributions were depicted by the Lorenz curve in Figure 6.1.

The Lorenz curves showed the cumulative contributions of percapita farm, agricultural-wage, and non-farm incomes to the cumulative percentages of households receiving each of the income sources. The diagonal line is the line of equal distribution which indicates a hypothetical condition where income is equally distributed among

households. The further the curve from the diagonal equal distribution line, the more unequal is the income distribution. It can be seen that agricultural-wage income was the most unequally distributed, followed by non-farm income. Farm income was the most equally distributed income source.

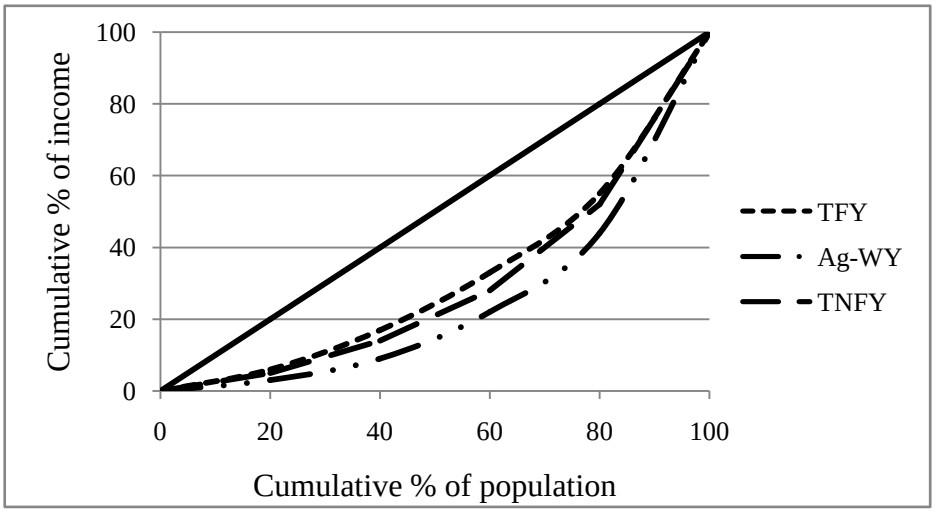


Figure 6.1: The Lorenz curve of rural income distribution

Note: TFY = total farm income; Ag-WY = agricultural-wage income; and TNFY = total non-farm income

As observed previously, the decomposition of the overall Gini coefficient (Table 6.3) showed that percapita farm income as a whole accounted for about 59 percent of overall inequality, while total non-farm income accounted for 36 percent of total inequality. This was due to the higher share of farm income in total household income (S_k) and the high Gini correlation between farm income and total income distribution (R_k), resulting in a large contribution to overall Gini. The lowest contribution to total inequality was from agricultural-wage income with only 5 percent, which was mainly due to the low values of S_k and R_k. More specifically, among the individual income sources total paddy income was the main contributor to total inequality with about 49 percent contribution and total non-farm wage income with 26 percent. This was also observed by Janaiah et al. (2000), Adams (2002) and Van den Berg and Kumbi (2006) for India, Egypt, and Ethiopia, respectively. This is because these households were

involved in low return non-agricultural activities. These studies also found that farm income contributed more to inequality compared to agricultural-wage and non-farm incomes.

Following the method by Liebbrandt et al. (2000) who differentiated between inequality resulting from households receiving an income source (P_kG_A) and from those having zero income from the same income source ($1 – P_k$), it was found that for income sources other than paddy income, it was primarily the inequality resulting from many households having zero income from a specific income source or non-participation, that contributes to the high Gini for a specific income source. As an example the G_k for non-farm wage income was the sum of (P_kG_A) = 0.1165 and ($1 – P_k$) = 0.6825, hence it was noted that the main contributor to the high Gini for non-farm wage income was the inequality resulting from many households having zero non-farm wage income. This was also observed in Tables 5.1 and 5.6 where only 41 percent were involved in non-farm activities with 32 percent of them participating in non-farm wage employment and about 9 percent in non-farm self-employment. This level of participation had resulted in a more unequal distribution of non-farm self-employment income with a Gini coefficient of 0.961 compared to a more egalitarian distribution of non-farm wage income, which had a Gini coefficient of 0.799.

The decomposition results can also be used to differentiate between inequality-increasing and inequality-decreasing income sources. According to the relative concentration coefficients (g_k), as shown in Table 6.3, non-farm income was found to be an inequality increasing income source. This was observed by Senadza (2011) and Canagarajah et al. (2001) for Ghana and Adams (2001) for Jordan. The inequality increasing effect of non-farm wage and non-farm self-employment incomes is partly attributed to the existence of entry barriers to these activities especially for the low income group. This would reduce their participation in high-return activities. In the

decomposition, all three non-farm income sources - non-farm wage income, self-employment, and other non-farm incomes - were inequality-increasing income sources as these incomes had a g_k value of greater than 1. This means that, ceteris paribus, any addition to these income sources will increase overall income inequality.

In contrast, the increments of farm and agricultural-wage incomes as well as remittance and transfers - represent inequality-decreasing income sources. Farm or crop income was also found to be an inequality decreasing income source by Nega et al. (2007) for Northern Ethiopia and Rozelle (1994) for rural China. It was also observed by Adams (2001) for land-rich areas of Africa where households are involved in farming. Although other non-farm income was an inequality-increasing source of income the individual components of this income source, in particular remittances, and transfers, were inequality-decreasing income sources. This was due to their relatively lower R_k and G_k values compared to rental incomes. This highlights the importance of distinguishing between different sources of income when assessing the effect of non-farm income on income inequality. The inequality decreasing effect of agricultural-wage income was also observed by Abdul Malek and Usami (2009) for developed rural areas of Bangladesh.

In the discussion on household income structure it was observed that most of the households in the high and medium-income groups were involved in non-farm employment. This was also reflected in the higher level and share of non-farm income in total household income of these groups of households. In relation to income distribution the inequality-increasing non-farm income sources were found to correlate quite highly with overall income distribution. This implied that an increase in these sources of income will mainly benefit the high- and medium-income households, hence resulting in a worsening of overall inequality. Conversely, incomes from farming, agricultural-wage, as well as remittances and transfers were inequality-decreasing

income sources as shown by their g_k values of less than 1. This implied that an increase in any of these income sources will benefit mainly the low income households hence decreasing inequality. This was in view of the higher share of these incomes in their total household income.

By comparing the incomes from two contrasting self-employment income earning activities of agricultural-wage employment and non-farm self-employment, it can be observed that the differences between these two income sources were due to three factors. First, the share in percapita income (S_k) for agricultural-wage employment was much higher (7 percent) compared to only 4 percent for non-farm self-employment income. Second, agricultural-wage income was more evenly distributed with a pseudo Gini value of 0.795, compared to non-farm self-employment income with a pseudo Gini value of 0.961. This was due to lesser household participation in non-farm self-employment. Third, the Gini correlations (R_k) indicate that the distribution of agricultural-wage income had lower correlation with the distribution of total income (0.386) compared to non-farm self-employment income (0.643). This indicated that in order to decrease the inequality contribution of non-farm self-employment income, there should be greater participation in non-farm self-employment. It would increase the share of non-farm self-employment income in total household income; decreasing the source Gini; and reducing the correlation of non-farm self-employment with the distribution of overall income.

Table 6.3: Decomposition of income inequality in Sungai Besar

Income source	Proportion of households receiving income source Pk	Correlation with total income distribution R_k	Pseudo Gini G_k	Income Share S_k	Gini G_A	Relative concentration of income source $g_k = R_kG_k/G$	Source elasticity of total inequality $[(S_kR_kG_k)/G] - S_k$	Percentage contribution to total inequality $(S_kR_kG_k)/G$
Farm income	**1.000**	**0.920**	**0.382**	**0.672**	**0.382**	**0.879**	**-0.081**	**59.07**
Paddy income	1.000	0.876	0.398	0.565	0.398	0.872	-0.072	49.27
Oil palm income	0.435	0.505	0.726	0.107	0.420	0.916	-0.009	9.81
Agricultural-wage income	**0.362**	**0.386**	**0.795**	**0.070**	**0.440**	**0.768**	**-0.016**	**5.37**
Non-farm income	**0.510**	**0.726**	**0.759**	**0.258**	**0.527**	**1.378**	**0.098**	**35.56**
Non-farm wage income	0.318	0.710	0.799	0.183	0.367	1.419	0.077	25.97
Self-employment income	0.086	0.643	0.961	0.036	0.552	1.546	0.020	5.56
Other non-farm income	0.217	0.468	0.882	0.039	0.457	1.032	0.001	4.03
Rental incomes	0.098	0.492	0.968	0.016	0.673	1.191	0.003	1.91
Remittance & transfer incomes	0.170	0.398	0.930	0.023	0.570	0.925	-0.002	2.13

Note: G_A is the Gini coefficient for an income source that is based on households with a positive income from the specific income source; G_k is the Gini coefficient for an income source that is based on all households in the sample. The values of G_k are high as they include households with zero and negative incomes from each income sources (Adams, 2001).

There are two possible effects of an increase in farmers' income from the sale of paddy on inequality. If high income households have higher income than others because of non-farm activities, an increase in paddy income due to an increase in government price support and input subsidies, may lead to a decrease in inequality. In contrast, if high income households have higher income due to higher paddy yield, factors that lead to an increase in agriculture income, such as land and subsidies, would increase income inequality. Although the sample was located in a major granary area, the first impact may dominate in some cases as there are about 19 percent of the households in the sample that had 61 percent of their income from non-farm income sources. In view of the increasing trend in the share of non-farm income which also implied greater participation of households in the granary area into non-farm activities, the first impact may continue to dominate in the future.

6.3.2 Inequality decomposition by household assets

The decomposition of the Gini coefficient by income sources had only identified the contribution of each income source to overall income inequality and the effect of each income source in increasing or decreasing total inequality. However, this approach to income decomposition was not able to identify the causes of inequality. In other words, the Gini decomposition, so far, cannot describe how household assets such as education, number of working members, and the size of cultivated land, for example, affect overall inequality. Therefore, a regression-based approach of decomposing inequality was used to analyze the effects of household assets.

Table 6.4 shows the decomposition results of income inequality by household asset. The rows in bold were the relative factor inequality weights for each of the broader household asset categories. Overall, the household assets were able to explain about 38 percent of overall inequality. The most important asset category to overall

inequality was human capital with a relative factor inequality weight (s_k) of 16.1 percent, followed by natural capital (12.5 percent), financial capital (3.6 percent), and social capital (3.2 percent). The other two asset categories, which were locational and physical assets, had very low contributions to overall inequality with 1.3 percent and 1.1 percent, respectively.

Among the important individual household assets determining the level of overall inequality was total cultivated land (LandSize), average education of working members (EDU), the number of working members (WLabor), and the percentage of land owned by a household (LandOwned). The residual from the total income regression explains 62 percent of total income inequality. By construction the relative factor inequality weights can only explain total inequality to the extent to which the regression explains total income, which was about 38 percent. Although the explanatory variables were only able to explain a relatively small fraction of income inequality, the results are useful in showing how the explained part of the income inequality was attributed to the different explanatory variables. This was also observed by Kimhi (2008), Arayama et al. (2006) and Naschold (2009). The percentage contributions to total inequality (p_k) as shown in Table 6.4 display the same pattern of results as the s_k but indicate how much each of the individual household assets contributes to the total inequality that can be explained.

The most important individual household asset that determines the level of inequality was the amount of cultivated land through its effect on farm income. This was because land was an important productive asset in granary areas. The size of cultivated land as measured by the sum of owned, rented, or cultivated land under share-cropping arrangements had the highest factor inequality weight compared to other variables. It accounts for about 8.6 percent of overall income inequality and 22.7 percent of the explained inequality (p_k). This variable also accounted for the single largest share in farm income inequality (15.4 percent) and agricultural-wage income

inequality (11.2 percent). However, the contribution of the percentage of land owned to total inequality was much lower (3.9 percent). This showed that for households in the study area, the size of cultivated land had a more dominant role in explaining overall inequality. This was in contrast to the findings by Naschold (2009) for rural Pakistan where land ownership rather than access to land was a greater contributor to income inequality. The factor inequality weights for land owned (5.4 percent) and irrigated land owned (2.8 percent) in Pakistan were larger than those for land and irrigated land operated.

The lower contribution of the percentage of land owned to total inequality compared to the size of cultivated land may be due to the availability of a land market in this granary area. The land market had enabled farmers to buy and/or rent land as well as be involved in share-cropping arrangement. As discussed previously in section 5.3.3., about 12.5 percent of the sampled households do not own any crop land; however they do have crop income as part of their household income. Furthermore, the distribution of cultivated and owned land in the study area was quite equal with a land Gini coefficient of 0.296 for cultivated land and 0.385 for owned land. The proportion of owned land was found to have a negative effect on the inequality in non-farm wage income. This was indicated by the negative factor inequality weight of this variable. On the contrary, the proportion of land owned caused inequality in farm income to increase. It was the second largest contributor (9.2 percent) to the inequality in farm income after the size of cultivated area (15.4 percent). This finding was also consistent with findings by Adams (2002) where the negative effect of the amount of land owned showed that land ownership was not linked to non-farm income and therefore, was more important to the poor. Consequently, the amount of land owned will decrease the inequality in non-farm wage income.

Table 6.4: Decomposition of overall inequality by household assets

	Total income		Farm income		Agricultural-wage income		Non-farm wage income		Non-farm self-employment income	
Assets	**s_k (%)**	**p_k (%)**	**s_k (%)**	**p_k (%)**	**s_k (%)**	**p_k (%)**	**s_k (%)**	**p_k (%)**	**s_k (%)**	**p_k (%)**
Human capital	**16.13**	**42.62**	**10.48**	**18.75**	**11.42**	**27.65**	**33.58**	**76.83**	**12.04**	**30.84**
AGE	-0.62	-1.63	1.83	3.28	3.70	8.97	-1.99	-4.56	-0.83	-2.12
AGE^2	0.78	2.06	-0.11	-0.20	0.88	2.14	2.14	4.90	2.48	6.35
HSIZE	3.17	8.39	3.72	6.66	5.78	13.99	4.70	10.76	6.81	17.45
WLabor	4.55	12.02	2.66	4.77	4.14	10.02	16.00	36.61	5.55	14.22
DEPENDENTS	0.77	2.04	-0.47	-0.85	0.22	0.54	1.37	3.12	-0.80	-2.05
EDU	7.47	19.75	2.85	5.11	-3.31	-8.02	11.36	26.00	-1.18	-3.01
Natural capital	**12.50**	**33.03**	**24.60**	**44.04**	**15.84**	**38.35**	**3.64**	**8.32**	**11.94**	**30.59**
LandSize	8.59	22.71	15.39	27.56	11.15	27.00	3.79	8.66	-0.67	-1.73
LandOwned	3.91	10.32	9.21	16.49	4.69	11.35	-0.15	-0.34	12.62	32.31
Physical capital	**1.12**	**2.96**	**5.87**	**10.50**	**7.41**	**17.94**	**-2.90**	**-6.63**	**-3.14**	**-8.03**
EQUIP	1.12	2.96	5.87	10.50	7.41	17.94	-2.90	-6.62	-3.14	-8.03
Social capital	**3.21**	**8.48**	**2.76**	**4.93**	**5.08**	**12.30**	**3.18**	**7.28**	**4.83**	**12.38**
SC	3.21	8.49	2.76	4.93	5.08	12.30	3.18	7.27	4.83	12.38
Financial capital	**3.57**	**9.42**	**7.86**	**14.08**	**5.49**	**13.30**	**2.03**	**4.65**	**7.63**	**19.54**
ONFY_share	0.08	0.21	0.05	0.09	0.12	0.30	0.72	1.65	-1.91	-4.88
CREDIT	3.49	9.21	7.81	13.98	5.37	13.00	1.31	3.00	9.53	24.42
Locational capital	**1.31**	**3.45**	**4.29**	**7.69**	**-3.94**	**-9.53**	**3.84**	**8.78**	**5.73**	**14.69**
DTIME	0.52	1.37	0.92	1.64	-0.22	-0.53	0.95	2.17	-1.97	-5.04
AREA	0.79	2.08	3.38	6.04	-3.72	-9.00	2.89	6.61	7.70	19.73
Residual	**62.15**		**44.14**		**58.71**		**56.28**		**60.95**	

Household composition, in particular the number of working members influenced a household's labor allocation decisions. Households with greater working members were better-off as they were able to allocate more labor to non-farm employment, which often provide higher returns. The importance of this variable to the level of inequality was reflected in its relatively high contribution (4.6 percent) in overall inequality through its share in the level of inequality in non-farm wage income (16 percent). The contribution of the number of working members in the non-farm wage income inequality was the highest compared to its contribution to the inequality of other income sources. Another important household asset was household size which had a positive contribution to the inequality in all income sources. However, household size had the highest contribution to the level of inequality of non-farm self-employment income (6.8 percent) followed by agricultural-wage and non-farm wage income (5.8 percent).

The effect of education on non-farm income inequality was expected because of its effect on a household's income earning ability. The average education of working members (EDU) had the second largest contribution (7.5 percent) to overall inequality through its contribution in non-farm wage income inequality (11.4 percent). This was about a 19.8 percent contribution to the explainable overall inequality. This suggested that education in general had an inequality increasing effect. Conversely, EDU had an inequality decreasing effect on the inequality in agricultural-wage and non-farm self-employment incomes. With higher education, households were able to participate in higher return agricultural-wage and non-farm self-employments especially for households with their own businesses. This would decrease the inequality among the recipients of these sources of incomes.

In terms of financial assets, having borrowing experiences (CREDIT) had a 3.5 percent share in the overall inequality through its effect mainly on the inequality in non-

farm self-employment income, followed by the inequality in farm and agricultural-wage incomes. Households having access to credit were able to purchase inputs for their businesses in addition to buying additional inputs such as fertilizers that would increase their farm income. They had also been found to use the loans they obtained to purchase farm equipment which had enabled them to participate in agricultural-wage employment compared to those without any excess to credit. In general, households who had invested the loans into productive income-generating activities had been able to obtain higher non-farm self-employment and agricultural-wage incomes. This was part of the reason for the relatively high contribution of CREDIT to overall inequality and to the three income sources.

Social capital also had a relatively high share in overall inequality with a relative factor inequality weight of 3.2 percent. The highest share of social capital in income inequality was in the inequality of agricultural-wage income (5.1 percent) followed by its share in non-farm self-employment income (4.8 percent). The level of social capital facilitates the flow of information and exchange of experience. Therefore, those with good networking were able to participate in agricultural-wage employment and self-employment activities. In addition to networking, the level of trust also enables these households to have easier access to financial capital.

In general, locational assets (DTIME and AREA) were also inequality increasing assets in all income sources except for their effect in the inequality of agricultural-wage income. Households located in Panchang Bedena had higher participation in non-farm employment as the town of Sungai Besar, which was the main trade center for the two study areas, was located in Panchang Bedena. The town of Tanjung Karang was another town that was closer to households in Panchang Bedena. The closer proximity of farm households in Panchang Bedena to these two towns as well as other rural towns provides greater access to non-farm employment opportunities, hence the significance

of household location to the level of income from non-farm employments. The negative shares of these two variables indicated that the time taken for households to travel to the nearest rural town and their location in Panchang Bedena compared to those who were not located in this area had actually decreased the level of inequality in agricultural-wage and non-farm self-employment incomes. Households are more inclined to participate in agricultural-wage employment and non-farm self-employment that are available in the study areas. Travel time to the nearest rural town had a very low share in overall inequality. This was partly due to the availability of good infrastructural facilities connecting the villages with towns and the ownership of vehicles which had reduced household dependence on public transportation.

The household asset category with the lowest share in overall inequality was physical capital. Farm equipment had an inequality increasing effect in farm and agricultural-wage income while it had an inequality decreasing effect in both non-farm incomes. This was expected because about 10 percent of paddy production cost was attributed to land preparation which required the use of tractor services. Therefore, farm households with their own tractors were able to reduce the cost of paddy production and as a result would have higher farm income. In addition, the farm equipment was also used in the provision of agricultural services to other farmers in the study area. Farm households who were able to provide these services had agricultural-wage income as a source of income. The importance of farm equipment was also shown by the significant positive effect of equipment value owned on the level of farm and agricultural-wage incomes. Since equipment referred to those that were used in farming it was not relevant to non-farm income generating activities, hence the negative share of EQUIP in non-farm income inequalities.

6.3.3 Inequality decomposition by livelihood clusters

Table 6.5 shows the Gini coefficients for different sources of income by livelihood clusters. As can be seen from the table, farm households that derive their income from the combination of farming and non-farm employment (clusters 3 and 4) had a higher percapita income Gini coefficient than other farm households.

Table 6.5: Percapita income and income inequality by livelihood clusters

Cluster	Mean percapita income (RM)	Gini coefficient			
		Percapita income	Farm income	Ag-wage income	Non-farm income
Highly specialized in farming (C1)	656	0.336	0.374	0.912	0.919
Farming and agricultural-wage employment (C2)	694	0.334	0.510	0.463	0.934
Specialization in non-farm employment (C3)	1310	0.385	0.372	0.887	0.358
Farming and/ non-farm employment (C4)	971	0.362	0.360	0.887	0.382

As previously noted, farm households often had more than one source of income. As a consequence, households with different livelihood strategies will have different income-generating functions. Therefore, there was the possibility of cross-equation dependencies (Arayama, et al., 2006; Fafchamps & Quisumbing, 1999). The regression results shown by Table 6.2, however, do not take this possibility into consideration. Therefore, a separate percapita income generating equation was estimated for each of the livelihood clusters described in Section 5.4. The grouping of households into livelihood clusters had resulted in different number of participants for each of the income-generating activities in each cluster. As a result, only three income functions - percapita income, percapita farm income and percapita agricultural-wage income - were estimated for each cluster, in order to enable a more efficient comparison. However, the non-farm income equations were only estimated for

households in clusters 3 and 4 due the few participating households in non-farm employment among households in clusters 1 and 2.

The results for the estimated percapita income equation are provided in Table 6.6. The estimation of the income functions for each of the livelihood clusters also showed that different assets will have different effects on the income functions in each livelihood clusters. In general, all household assets had the expected signs. As with the significant effect of household size on the percapita income for the whole sample, this variable was also significant to households in clusters that combine farming and non-farm employment (clusters 3 and 4). A larger household size implied greater labor supply. For households in cluster 3, especially, the number of working members also had a significant positive effect on percapita income. This together with the significant positive effect of average education of these working members had enabled households in cluster 3 to earn the highest mean percapita income (Figure 5.2) and had more than 50 percent of their income share (Figure 5.1) from non-farm income sources.

The size of cultivated land was found to have a positive significant effect ($t = 2.806$, $p < 0.05$) on the percapita income of households who were in cluster 1 which was highly specialized in farming cluster and cluster 3 which was specialization in non-farm employment. The effect of this variable on the percapita income of households in cluster 1 was obvious because households in this cluster were all full-time farmers hence farming was their main source of income generating activity. As for households in cluster 3, they had the lowest cultivated land area (Table 5.24). This showed that households in this cluster were "pushed" into non-farm employment, in particular, non-farm wage employment as their main source of income.

Table 6.6: Determinants of percapita income by livelihood cluster

Asset	Total sample	Cluster 1 Highly specialized in farming	Cluster 2 Farming & Ag - wage employment	Cluster 3 Specialization in non-farm employment	Cluster 4 Farming & Non-farm employment
C	1.858**	2.279**	3.042**	1.191	1.932**
	(8.518)	(5.136)	(4.227)	(1.406)	(2.229)
AGE	0.003**	0.124**	0.008	0.004	-0.007
	(3.430)	(2.284)	(0.421)	(0.213)	(-0.292)
AGE^2	-0.035	-0.183**	-0.013	-0.006	0.017
	(-0.775)	(-2.510)	(-0.667)	(-0.334)	(0.321)
HSIZE	0.242**	0.101	0.029	0.161**	0.231**
	(6.592)	(1.823)	(0.325)	(4.235)	(2.688)
WLabor	0.056**	0.112**	0.054**	0.056**	0.028
	(6.888)	(2.069)	(3.095)	(3.021)	(1.405)
DEPENDENTS	-0.063	- 0.123**	-0.099	-0.027	-0.278
	(-1.282)	(-2.967)	(-1.486)	(-0.378)	(-1.641)
EDU	0.055**	0.142	0.098	0.086**	0.031**
	(2.115)	(1.326)	(1.411)	(2.026)	(2.053)
LandSize	0.141**	0.073**	0.040	0.145**	0.092
	(8.033)	(2.806)	(1.105)	(2.086)	(1.741)
LandOwned	0.113	0.145**	-0.061**	-0.057	0.002**
	(0.033)	(3.544)	(-2.452)	(-0.567)	(2.520)
EQUIP	0.004	0.025**	0.056**	0.007	0.012
	(0.560)	(2.379)	(2.664)	(1.400)	(1.381)
SC	0.035	0.044	0.062**	0.016**	0.031
	(1.347)	(1.359)	(2.818)	(3.070)	(2.140)
ONFY_share	0.022	0.034	0.093	0.014	0.030
	(1.571)	(1.363)	(1.127)	(0.368)	(0.904)
CREDIT	0.016**	0.061	0.095	0.040	0.034
	(3.556)	(1.392)	(1.145)	(0.423)	(0.443)
DTIME	-0.032	-0.050	-0.038	-0.068	-0.018
	(-1.305)	(-1.407)	(-0.713)	(-0.955)	(-0.296)
AREA	0.210**	0.097**	0.228	0.114**	0.104**
	(8.118)	(2.221)	(1.436)	(3.157)	(2.996)
R-squared	0.3785	0.4341	0.6254	0.4135	0.5670

Notes: ** significant at 5% level. Numbers in brackets are t-values.

Farm equipment was observed to have a positive significant effect to percapita income of households in cluster 1 (t = 2.379, $p < 0.05$) and cluster 2 (t = 2.664, $p < 0.05$). As discussed previously, farm equipment was used by farmers in paddy production and in providing agricultural services to other farmers in the study areas. As

a consequence, their cost of producing paddy decreases and in addition, for households in cluster 2 they were also able to earn income from the farm equipment through the provision of agricultural services. In relation to the provision of agricultural services, social capital was an important factor to agricultural-wage income and also to non-farm self-employment income. This was especially true for households in clusters 2 and 3. This was because of the importance of networking and trust in securing employment opportunities in agricultural-wage and non-farm self-employment.

Household location in Panchang Bedena was found to have a positive significant effect on the percapita income of households who were involved in non-farm employment, in particular households in cluster 3 ($t = 3.157$, $p < 0.05$) and cluster 4 ($t = 2.996$, $p < 0.05$). This suggested that household location in this area had provided them with greater access to non-farm employment opportunities. These findings implied that the contribution of income determinants to income inequality were likely to vary across livelihood clusters. Table 6.7 shows the contributions of household assets to the Gini coefficient for percapita income of each livelihood cluster.

The inequality decomposition results in Table 6.7 show that natural capital had the largest share in the level of inequality in the percapita income for households who earn most of their income from farming (clusters 1) and those that combined farming and agricultural-wage employment (clusters), with a 17 percent share in both clusters. The contribution of human capital, on the other hand, was the highest in the inequality of percapita income for livelihood clusters that combine farming and non-farm employment (clusters 3 and 4). In terms of individual household assets, the contribution of education was predominantly among households who had a major share of their income from non-farm employment (cluster 3). Household size had the greatest share in the inequality of percapita income of households that were mostly full-time farmers

such as those in cluster 1 and also of farmers that are involved in some form of non-farm employment (clusters 3 and 4). Another important human capital variable with a relatively high contribution to the inequality (6 percent) among households involved in non-farm employment was the number of working members.

Table 6.7: Decomposition of percapita income inequality by livelihood clusters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4
	Total sample	Highly specialized in farming	Farming / Ag. wage employment	Specialization in non-farm employment	Farming / Non-farm employment
Assets	s_k (%)	s_k (%)	s_k (%)	s_k (%)	s_k (%)
Human capital	**16.13**	**13.55**	**10.24**	**22.35**	**26.37**
AGE	-0.62	-0.34	2.64	-2.79	-0.29
AGE^2	0.78	0.59	-3.74	1.31	-0.42
HSIZE	3.17	15.47	-0.70	7.01	9.83
WLabor	4.55	1.12	5.23	6.33	6.42
DEPENDENTS	0.77	-1.96	3.86	0.54	4.87
EDU	7.47	-1.33	2.94	9.94	5.96
Natural capital	**12.50**	**17.22**	**16.95**	**6.44**	**11.24**
LandSize	8.59	10.66	12.16	4.74	7.67
LandOwned	3.91	6.55	4.79	1.70	3.57
Physical capital	**1.12**	**6.38**	**12.68**	**3.31**	**4.57**
EQUIP	1.12	6.38	12.68	3.31	4.57
Social capital	**3.21**	**1.54**	**6.41**	**1.26**	**3.39**
SC	3.21	1.54	6.41	1.26	3.39
Financial capital	**3.57**	**3.60**	**12.42**	**2.88**	**6.91**
ONFY_share	0.08	1.39	3.35	-1.13	2.24
CREDIT	3.49	2.21	9.07	4.02	4.67
Locational capital	**1.31**	**1.13**	**3.81**	**5.17**	**4.23**
DTIME	0.52	-1.98	1.74	2.86	2.30
AREA	0.79	3.11	2.07	2.30	1.92
Residual	**62.15**	**56.60**	**37.50**	**58.60**	**43.30**

The contribution of the value of farm equipment owned to overall inequality was relatively high for households who were heavily involved in farming and agricultural services, particularly for households in clusters 1 and 2. The share of the value of farm equipment in the inequality of income among households in cluster 2 who were involved in agricultural-wage employment (12.7 percent) was higher than for

households in cluster 1 who were highly specialized in farming (6.4 percent). Another important contributor to inequality among livelihood clusters was social capital with the highest contribution (6.4 percent) to the income inequality of households in cluster 2.

The following regression results represent the estimations for farm, agricultural-wage and non-farm labor incomes across livelihood clusters followed by the analysis of the contribution of each household asset on the inequality in these income sources for each of the livelihood clusters. The estimation of the non-farm income equations were made only for households in clusters 3 and 4. This was because there were only four participating households in clusters 1 and 2.

The regression results in Table 6.8 show several notable differences in the farm income generating equation across livelihood clusters. The number of working members had a significant negative effect for households who are highly specialized in farming compared to the positive effect in the aggregate results. Also, the negative effect of number of dependents, in the aggregate results, was found to be negatively significant only for households in cluster 1 and for those who combined farming and non-farm employment (clusters 3 and 4). The negative effect of average education of working members in the aggregate results was observed for households in clusters 1 and 4 but it had a positive effect on the farm income of households in clusters 2 and 3.

Table 6.8: Determinants of percapita farm income by livelihood cluster

Asset	Total sample	Cluster 1 Highly specialized in farming	Cluster 2 Farming & Ag. wage employment	Cluster 3 Specialization in non-farm employment	Cluster 4 Farming & Non-farm employment
C	2.329**	-1.082	-1.385	0.722	-0.267
	(4.474)	(-0.720)	(-0.840)	(1.096)	(-0.306)
AGE	0.169	0.011**	0.086	0.043**	0.060**
	(1.539)	(2.224)	(1.874)	(2.523)	(2.147)
AGE^2	-0.001	-0.014**	-0.079	-0.041**	-0.053**
	(-0.435)	(-2.854)	(-1.743)	(-2.527)	(-2.051)
HSIZE	0.164**	0.014	0.128	0.205**	0.034
	(4.320)	(0.414)	(0.620)	(2.723)	(0.567)
WLabor	0.035	-0.030**	-0.041	0.013	0.018
	(0.591)	(-3.245)	(-1.024)	(0.179)	(1.068)
DEPENDENTS	-0.027	0.103**	-0.151	-0.081**	-0.100**
	(-1.181)	(3.094)	(-0.991)	(-2.504)	(-2.693)
EDU	-0.140	-0.082**	0.158	0.059	-0.045**
	(-1.647)	(-2.385)	(0.996)	(1.837)	(-3.572)
LandSize	0.132**	0.157**	0.053**	0.079**	0.082**
	(2.344)	(5.238)	(4.417)	(7.900)	(2.412)
LandOwned	0.101**	0.125**	0.033**	0.018	0.031
	(3.034)	(2.910)	(2.357)	(1.125)	(1.476)
EQUIP	0.011	0.022**	0.013**	0.009	0.010**
	(0.033)	(3.177)	(3.133)	(0.600)	(3.761)
SC	0.091**	0.050	0.097**	0.011	0.075
	(2.118)	(0.281)	(6.085)	(0.275)	(1.974)
ONFY_share	0.060**	0.041**	0.047	0.012	0.061
	(2.869)	(2.751)	(0.733)	(0.383)	(1.143)
CREDIT	0.024**	0.064**	0.110**	0.035	0.036
	(3.093)	(2.095)	(3.226)	(0.488)	(0.614)
DTIME	-0.053	0.044	0.028	-0.125**	-0.163**
	(-1.755)	(1.761)	(0.230)	(-4.167)	(-4.843)
AREA	0.003	0.124**	0.064	0.121**	0.028
	(0.124)	(3.584)	(0.477)	(2.432)	(0.643)
R-squared	**0.5586**	**0.5926**	**0.6628**	**0.586**	**0.6006**

Notes: ** significant at 5% level. Numbers in brackets are t-values.

The positive significant effect of total cultivated area was experienced by all households across different livelihood clusters. Meanwhile, the positive effect of the proportion of land owned by a household becomes positively significant for highly specialized farmers (cluster 1) and those with the livelihood cluster that combined farming and agricultural-wage employment (cluster 2).

The positive effect of the value of equipment owned becomes statistically significant among all households except for those who had non-farm labor income as their main source of income (cluster 3). Despite having the second highest value of equipment owned, households in cluster 3 had the smallest size of cultivated land. It is the size of cultivated land that determines the level of farm income as shown by the positive significant effect of LandSize on the level of farm income across all clusters. The positive effect of social capital was significant among households who had both farm income and agricultural-wage income. On average, households in clusters 1 and 2 have a relatively higher social capital index. This would suggest that they have greater networking, trust, and exposure to information regarding the availability of assistance and other facilities relevant to crop production.

The share of other non-farm income was observed to have a positive effect on the level of all income sources for all households across the livelihood clusters but it was statistically significant only among highly specialized farmers. This indicates that other non-farm income was being used productively in farming through the purchase of agricultural inputs and land rentals. The positive significant effect of access to credit, on the other hand, was significant among households who had a major share of income from crops and from the combination of farming and agricultural-wage employment. As with the share of other non-farm income, having borrowing experiences also enabled these households to purchase agricultural inputs hence increasing their farm income.

The amount of time taken to reach the nearest rural town center had a negative significant effect among households who were involved with non-farm employment. This is because they have to allocate more time to non-farm employment compared to farming. Consequently, they will have to decrease the amount of time allocated to crop management which would probably decrease crop yield. They may have to rely on hired labor, which will increase their production cost hence decreasing their net farm income.

Table 6.9 show the regression results from the estimation of agricultural-wage income across livelihood clusters. The number of working members was found to have a positive effect on the level of agricultural-wage income in all clusters except for cluster 4. However, the positive significant effect as observed in the aggregate results was only found for cluster 2. All of the households in cluster 2 were involved in agricultural-wage employment through the provision of agricultural services to other farms. This was supported by the equipment that they owned which was reflected in the positive significant effect of the value of equipment owned on the level of agricultural wage income for households in this cluster. The average education of working members had a negative effect on the level of agricultural-wage income for all clusters. Nevertheless, the significant negative effect in the aggregate results was observed for households that combined farming and non-farm employment (clusters 3 and 4). The more educated family members are allocated to non-farm employments rather than to agricultural-wage employment, hence the significant negative effect on the level of agricultural-wage income for these clusters.

Table 6.9: Determinants of percapita agricultural-wage income by livelihood cluster

Asset	Total sample (Tobit)	Cluster 1 Highly specialized in farming (Tobit)	Cluster 2 Farming & Ag. wage employment (OLS)	Cluster 3 Specialization in non-farm employment (Tobit)	Cluster 4 Farming & Non-farm employment (Tobit)
C	-4.701**	7.743	2.786**	-2.636	2.412
	(-3.502)	(1.070)	(2.698)	(-0.602)	(1.960)
AGE	0.016	0.265	0.008	0.976	0.030
	(0.698)	(1.603)	(0.264)	(1.687)	(0.800)
AGE^2	-0.014	-0.206	-0.011	-0.902	-0.032
	(-0.643)	(-1.255)	(-0.373)	(-1.558)	(-0.902)
HSIZE	0.037	0.460	0.140	-0.026	0.037
	(0.348)	(0.477)	(1.086)	(-1.239)	(1.046)
WLabor	0.190**	0.075	0.095**	0.110	-0.072
	(6.171)	(0.406)	(2.689)	(0.298)	(-0.257)
DEPENDENTS	-0.038	-0.045	-0.009	-0.040	0.040
	(-0.391)	(-0.060)	(-0.092)	(-0.021)	(0.543)
EDU	-0.171**	-0.025	-0.038	-0.133**	-0.031**
	(-2.361)	(-0.035)	(-1.567)	(-2.813)	(-2.770)
LandSize	-0.145**	-0.158**	-0.162**	-0.121	-0.132**
	(-3.201)	(-2.036)	(-2.644)	(-0.945)	(-2.129)
LandOwned	-0.021	-0.082**	-0.031**	-0.040**	-0.013**
	(-1.029)	(-7.861)	(-2.09)	(-2.698)	(-2.214)
EQUIP	0.030	0.056	0.089**	0.012	0.062
	(1.082)	(0.306)	(2.493)	(0.350)	(1.563)
SC	0.057**	0.073	0.057**	0.059	0.176
	(5.277)	(1.319)	(2.008)	(0.807)	(1.369)
ONFY_share	-0.015	-0.031	0.084**	-0.033**	0.250**
	(-0.289)	(-0.134)	(2.067)	(-2.113)	(2.113)
CREDIT	0.110	0.755	0.124	0.249	1.286
	(1.043)	(1.004)	(1.046)	(0.144)	(1.111)
DTIME	-0.047	-0.522	-0.066	-0.106	-0.012
	(-0.595)	(-0.946)	(-0.858)	(-1.136)	(-0.270)
AREA	-0.184**	-0.806**	-0.046**	-1.261**	-1.499**
	(-2.262)	(-2.108)	(-2.544)	(-2.819)	(-2.656)
R-squared			32.97		
Log likelihood	-194.866	-148.557		-44.105	-69.645
Left censored observations	229	123		56	50

Notes: ** significant at 5% level. The t-values for OLS regression and z-values for Tobit regression are in brackets.

In terms of natural capital, the size of cultivated land was found to have a significant negative effect on the level of agricultural-wage income in all clusters except for cluster 3. Meanwhile the negative effect of the proportion of land owned by a household becomes negatively significant for all households across clusters. Households in these three clusters had a higher size of average cultivated area hence more labor time had to be allocated to their own farm.

The negative effect of the share of other non-farm income in the aggregate results became negatively significant for households in cluster 3 but positively significant for households in clusters 2 and 4. As was discussed earlier, this indicated that the other non-farm income received, such as pensions, remittances and rental incomes, had been used productively in agricultural-wage activities. Household location in Panchang Bedena had a negative effect on agricultural-wage income across clusters but the effect was significant only for households in cluster 2. As was shown in Table 5.1 there were greater participation of households in Bagan Terap (40 percent) in agricultural-wage employment compared to those in Panchang Bedena (33 percent).

There were also considerable differences observed in the regression results for non-farm labor income across livelihood clusters as shown in Table 6.10. For non-farm labor income a positive effect of household size and the number of working members were observed for all households in clusters 3 and 4 but the significant positive effect as observed for the aggregate results was only found for cluster 3. This is due to greater participation of cluster 3 households in non-farm labor employment as shown in Table 5.21. Having a higher education level had enabled this greater participation. The importance of education to non-farm labor income was shown by the positive significant effect of average education of working members.

Table 6.10: Determinants of percapita non-farm income by livelihood cluster

Asset	Total sample (Tobit)	Cluster 3 Specialization in non-farm employment (OLS)	Cluster 4 Farming & non-farm employment (Tobit)
C	-11.968**	-2.444	-0.948
	(-2.596)	(-1.116)	(-0.282)
AGE	0.176	0.078**	0.103
	(1.422)	(2.472)	(1.046)
AGE^2	-0.174	-0.083**	-0.104
	(-1.433)	(-2.567)	(-1.076)
HSIZE	0.147**	0.126**	0.129
	(2.333)	(4.196)	(0.419)
WLabor	0.135**	0.114**	0.070
	(4.397)	(2.267)	(0.996)
DEPENDENTS	-0.105	-0.033	-0.046
	(-0.265)	(-0.162)	(-0.297)
EDU	0.196**	0.116**	0.062
	(3.595)	(2.543)	(1.176)
LandSize	-0.062**	-0.006	-0.075**
	(-2.747)	(-0.370)	(-4.412)
LandOwned	-0.003	-0.004	-0.016**
	(-0.708)	(-1.503)	(-2.034)
EQUIP	0.003	-0.005	-0.008
	(0.299)	(-1.200)	(-1.579)
SC	0.074	0.003	0.022
	(1.297)	(0.239)	(1.345)
ONFY_share	0.178	0.039**	0.369**
	(0.827)	(3.250)	(3.653)
CREDIT	0.059	0.078**	0.525
	(1.972)	(2.294)	(1.712)
DTIME	-0.027**	-0.329	-0.418
	(-2.595)	(-1.706)	(-1.779)
AREA	0.041	0.199**	0.254**
	(0.781)	(3.902)	(2.288)
R-squared		0.4763	
Log likelihood	-458.581		-42.603
Left censored obs	225		36

Notes: ** significant at 5% level. Numbers in brackets are t-values and z-values.

The significant negative effect of total cultivated land on the level of non-farm labor income was observed for households in cluster 4 that had a much higher share of their income from farming. These households also had a higher average cultivated land compared to households in cluster 3. Furthermore, households in cluster 3 were less dependent on farm income as they had about 61 percent of their income from non-farm income sources.

For the share of other non-farm income (ONFY_share) which consists of remittances, pensions, zakat and rental incomes, the positive effect in the aggregate results became significantly positive for households in both clusters. The positive significant effect was due to the productive use of this income source, especially among those who were involved in non-farm self-employment. The positive effect of borrowing experience, which was not significant in the aggregate results, becomes statistically significant for households who were specializing in non-farm employment (cluster 3). The availability of credit had enabled households to purchase inputs for their businesses. The positive effect of household location in Panchang Bedena became significantly positive for households who combined farming and non-farm employment (clusters 3 and 4). This was partly due to greater access to non-farm employment opportunities from rural towns in the surrounding area and closer proximity to large towns, compared to households in Bagan Terap.

Some of the differences in the coefficients of the income-generating equations across livelihood clusters were also reflected in the contributions to inequality of the corresponding household asset variables. These are reported in Tables 6.11, 6.12 and 6.13, for farm, agricultural-wage, and non-farm incomes, respectively. In the following discussion the focus was on the asset variables that were mentioned earlier as having notably different coefficients in the source- and cluster-specific income generating equations.

Beginning with the contributions to inequality through farm income (Table 6.11) it was found that the highest contribution of household size was among households that derived their income from the combination of farming and agricultural-wage employment (7.2 percent) followed by those who specialize in non-farm employment (7.0 percent). However, the contribution of this variable to farm income inequality among households with agricultural-wage employment income (cluster 2) was based on a variable that was not significant. The positive contribution of the number of working members to inequality ranged from 3.9 percent to 9.2 percent and was most pronounced among households who had farm income as their main source of income. The positive contribution of average education of working members to inequality (8.7 percent) was mostly among households that earn most of their income from non-farm employment (cluster 3).

Total cultivated area had a relatively high share in farm income inequality across households in different clusters, ranging from 10.6 percent to 22.1 percent. This variable was also found to have a significant positive effect on the level of farm income across clusters. On the contrary, the proportion of land owned by households had a negative contribution to the inequality among farm households with agricultural-wage income. This means that the proportion of land owned decreases the inequality in farm income for households in cluster 2 by about 3 percent. In terms of physical asset, although farm equipment had the highest share (6.1 percent) in farm income inequality among households specializing in non-farm employment, this contribution was based on a coefficient that was not significant in the farm income-generating equation.

The positive contribution of the social capital variable to inequality also varies across the livelihood clusters, with the highest contribution to the inequality among households with agricultural-wage income (8.7 percent) followed by those that combine farming with non-farm income (4.6 percent). Household borrowing experiences had a

positive contribution to inequality for all clusters. However, the effect of this variable was most pronounced among household who were full-time farmers and those that combine farming and agricultural-wage employment (10.4 percent). Household location in Panchang Bedena had a positive effect on inequality among households who had non-farm income. In contrast, this asset had decreased the inequality of farm income among highly specialized farmers and those that combine farming and agricultural-wage employment.

Table 6.11: Decomposition of percapita farm income inequality by livelihood clusters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4
	Total sample	Highly specialized in farming	Farming & Ag. wage employment	Specialization in non-farm employment	Farming & Non-farm employment
Assets	s_k (%)	s_k (%)	s_k (%)	s_k (%)	s_k (%)
Human capital	**10.48**	**15.89**	**21.84**	**23.93**	**19.32**
AGE	1.83	1.21	2.27	-2.26	1.84
AGE^2	-0.11	3.96	-1.96	4.24	3.37
HSIZE	3.72	3.72	7.18	7.03	3.67
WLabor	2.66	8.44	9.22	3.90	8.86
DEPENDENTS	-0.47	-1.30	-0.51	2.28	4.54
EDU	2.85	-0.14	5.63	8.73	-2.95
Natural capital	**24.60**	**27.03**	**16.76**	**14.33**	**22.92**
LandSize	15.39	22.11	19.79	10.56	14.29
LandOwned	9.21	4.92	-3.03	3.77	8.63
Physical capital	**5.87**	**3.29**	**5.66**	**6.05**	**4.39**
EQUIP	5.87	3.29	5.66	6.05	4.39
Social capital	**2.76**	**2.37**	**8.69**	**4.63**	**3.49**
SC	2.76	2.37	8.69	4.63	3.49
Financial capital	**7.86**	**7.96**	**8.62**	**3.78**	**7.38**
ONFY_share	0.05	-0.67	-1.78	-1.35	2.11
CREDIT	7.81	8.63	10.41	5.12	5.27
Locational capital	**4.29**	**2.71**	**4.73**	**5.88**	**2.56**
DTIME	0.92	3.29	6.66	0.38	-1.62
AREA	3.38	-0.57	-1.92	5.49	4.18
Residual	**44.14**	**40.74**	**33.70**	**41.40**	**39.94**

In analyzing the contributions to inequality through agricultural-wage income (Table 6.12) it was found that the positive contribution of number of working members

was mostly among households that derived their income from the combination of farming and agricultural-wage employment (7.5 percent). The contribution of this variable to agricultural-wage income inequality among households with agricultural-wage employment income (cluster 2) was based on a variable that was also positively significant. The average education of working members has the greatest inequality decreasing effect among households who combined farming and agricultural-wage employment. On the contrary, it has the highest inequality increasing effect among households that earn most of their income from farming and participation in non-farm employment (cluster 4).

Table 6.12: Decomposition of percapita agricultural-wage income inequality by livelihood clusters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4
	Total sample	Highly specialized in farming	Farming & ag. wage employment	Specialization in non-farm employment	Farming & non-farm employment
Assets	s_k (%)	s_k (%)	s_k (%)	s_k (%)	s_k (%)
Human capital	**11.42**	**8.84**	**4.37**	**3.95**	**12.12**
AGE	3.70	1.22	1.90	1.48	-2.27
AGE^2	0.88	-1.57	-2.48	-0.72	2.75
HSIZE	5.78	2.55	4.76	2.75	5.23
WLabor	4.14	4.14	7.46	2.47	-3.26
DEPENDENTS	0.22	3.35	-1.73	3.12	3.20
EDU	-3.31	-0.86	-5.55	-5.14	6.47
Natural capital	**15.84**	**-3.88**	**2.52**	**6.33**	**7.47**
LandSize	11.15	-2.23	-4.05	3.19	3.93
LandOwned	4.69	-1.65	6.57	3.14	3.54
Physical capital	**7.41**	**4.60**	**6.23**	**2.97**	**-2.02**
EQUIP	7.41	4.60	6.23	2.97	-2.02
Social capital	**5.08**	**4.05**	**4.56**	**-3.79**	**-4.19**
SC	5.08	4.05	4.56	-3.79	-4.19
Financial capital	**5.49**	**3.90**	**8.14**	**5.64**	**11.38**
ONFY_share	0.12	-0.37	4.90	3.02	4.02
CREDIT	5.37	4.27	3.24	2.62	7.36
Locational capital	**-3.94**	**1.04**	**7.07**	**6.27**	**3.85**
DTIME	-0.22	-2.36	2.32	3.91	2.60
AREA	-3.72	3.40	4.75	2.36	1.26
Residual	**58.71**	**81.36**	**67.03**	**78.59**	**71.39**

Total cultivated area had the highest negative share in agricultural-wage income inequality for households in cluster 2 (-4.1 percent), followed by the inequality in cluster 1 (-2.3 percent). This shows that the size of cultivated area decreases the inequality in agricultural-wage income among these households. This variable was found to have a significant negative effect on the level of agricultural-wage income for cluster 4. However, it had a positive contribution to the agricultural-wage income inequality for this cluster. On the contrary, the proportion of land owned by households had a positive contribution to the agricultural-wage income inequality among households in clusters 2, 3 and 4. But this variable had been shown to have a significant negative effect on the level of agricultural-wage income of these households. In terms of physical asset, the value of farm equipment had the highest share in the inequality among households in cluster 2 (6.2 percent) and this contribution was based on a coefficient that was also significant in the agricultural-wage income-generating equation.

The positive contribution of the social capital variable to the inequality in agricultural-wage income also varies across the livelihood clusters, with the highest contribution to the inequality among households in cluster 2 (4.6 percent) and cluster 1 (4.1 percent). This variable was also positively significant to the level of agricultural-wage income for these two clusters. On the contrary, social capital caused a reduction in the level of inequality in agricultural-wage income for households in cluster 4 (-4.2 percent) and followed by those in cluster 3 (-3.8 percent). However, it was not significant to the level of agricultural-wage income for these households. The share of other non-farm income had a positive contribution to the inequality of agricultural-wage income for clusters 2, 3 and 4. The effect of this variable was the highest among household who combined farming and agricultural-wage employment (4.9 percent). Household location in Panchang Bedena had a positive effect on inequality among all

households. The largest contribution (4.8 percent) was most pronounced among households in cluster 2. There are more farms in Panchang Bedena compared to Bagan Terap. Therefore, households located in Panchang Bedena would have greater access to agricultural-wage employment opportunities.

In analyzing the contributions of household assets to inequality through non-farm income (Table 6.13), household size, the number of working members, and average education of working members, had relatively large contributions among households who had non-farm income especially among those with specialization in non-farm employment. This contribution was based on variables that were positively significant to the level of non-farm income. The greater the household size, assuming they have greater number of working members rather than dependents, the more the family labor that they can allocate to non-farm employment. In addition, households with a higher education level for its working members will be able to enter into highly remunerative non-farm employment. These will result in a greater contribution of these variables to the inequality in non-farm income.

The negative share of total cultivated area and the proportion of land owned by households, in the decomposition of aggregate non-farm income were observed only for households in cluster 4. This showed that these two household assets decreased the non-farm income inequality among these households. This is because the larger the cultivated land size and the proportion of land owned, the lesser the need to participate in non-farm labor employment. The positive effect of land-owned on non-farm income inequality, as shown for households in cluster 3, is in contrast to the findings by Arayama et al. (2006). This is because for rural households in Korea, land serves as collateral for securing loans for their businesses. However, the inequality increasing effect of land owned is similar to the results from the findings by Nega et al. (2007).

Table 6.13: Decomposition of percapita non-farm income inequality by livelihood clusters

		Cluster 3	Cluster 4
	Total sample	Specialization in non-farm employment	Farming & non-farm employment
Assets	s_k (%)	s_k (%)	s_k (%)
Human capital	**24.10**	**29.57**	**20.33**
AGE	-4.40	-3.34	-2.12
AGE^2	5.38	-4.14	2.05
HSIZE	12.55	7.92	5.97
WLabor	10.14	10.99	6.42
DEPENDENTS	-7.91	0.86	2.92
EDU	8.34	17.29	5.09
Natural capital	**-7.44**	**5.43**	**-9.41**
LandSize	-3.12	2.24	-5.04
LandOwned	-4.32	3.20	-4.37
Physical capital	**3.44**	**2.75**	**4.27**
EQUIP	3.44	2.75	4.27
Social capital	**7.56**	**3.03**	**4.32**
SC	7.56	3.03	4.32
Financial capital	**9.95**	**2.49**	**8.40**
ONFY_share	2.28	0.28	4.61
CREDIT	7.68	2.20	3.79
Locational capital	**6.25**	**4.52**	**4.24**
DTIME	-2.05	-0.75	-0.81
AREA	8.30	5.26	5.05
Residual	**55.94**	**52.37**	**67.85**

With higher education, household members will be able to obtain higher-return non-farm wage employment hence increasing non-farm income inequality. Finally, the contribution of financial capital to the inequality in non-farm income was much higher in cluster 4 (8.4 percent) compared to cluster 3 (2.5 percent). This contribution was based on the significant variable of the share of other non-farm income in the non-farm income equation. Although the contribution from CREDIT was relatively larger in the inequality in cluster 4 compared to cluster 3, this variable was found to be not significant to the level of non-farm income for cluster 4.

6.4 Summary of findings

This chapter presented the results of the econometric models used in the analysis of household income and the results from the decomposition of income inequality. The results show that human capital (age of household head, household size, the number of working members, and average education of working members), natural capital (size of cultivated area) and locational capital (household location) had different effects on the levels of incomes and their distribution. The analysis of incomes by activity showed that household size, total cultivated area, the proportion of land owned, borrowing experience, value of equipment owned, and social capital had a significant positive effect on the income from farming. On the contrary, the size of cultivated land had a significant negative effect on agricultural-wage income.

The value of farm equipment owned has a significant positive association with farm and agricultural-wage incomes. The significant effect may be due to the utilization of machinery and equipment, which had increased the productivity of both labors by enhancing the speed of agricultural operations; and land by facilitating the adoption of improved production technologies. Similar to their effects on the selection of livelihood which combined farming and non-farm employment, household size, the number of working members, and the average education of working members had a significant positive effect on the income from non-farm wage employment. For non-farm self-employment income, the significant factors include the number of working members, borrowing experience, social capital, and household location. All of these factors had a significant positive effect on the level of non-farm self-employment income except for the number of working members, which significantly decreases the level of non-farm self-employment income.

The determination of the Gini coefficient showed that income was rather unevenly distributed when households earn incomes from non-farm income sources. This indicated that non-farm income was an inequality increasing income source. The analysis of rural income inequality showed that farm income was the main contributor to total inequality, followed by non-farm income. Given the largest share of farm income in total household income; the overall contribution of this income source to overall Gini was also the largest. More specifically, the high contribution of farm income to total inequality was due to the high contribution from paddy income. Despite its largest share in total household income, farm income had been found to be an inequality decreasing income source. In contrast, given the much smaller share of non-farm income in total income its contribution to the overall Gini was much smaller. Within the non-farm income category, the greatest source of inequality was from non-farm wage employment. Income from agricultural-wage employment was the smallest contributor to the overall Gini, which was partly due to its smallest share in total household income. This finding was consistent with the earlier descriptive findings.

The decomposition of overall inequality by household assets found that human capital was the main contributor to overall inequality (16.3 percent). This was followed by natural capital (12.5 percent), financial capital (3.6 percent), social capital (3.2 percent), locational capital (1.3 percent), and finally physical capital (1.1 percent). In terms of specific household assets the average education of working members and the size of cultivated land were the most important contributors to overall inequality.

The contributions to inequality were further disaggregated by livelihood clusters. It was found that the contribution of household size and number of working members to income inequality through farm income were most prominent among households that had both farming and agricultural-wage employment (cluster 2). This was relevant

because obtaining income from multiple sources requires the use of labor from relatively many household members. However, the coefficient for household size in the farm income equation for cluster 2 was not statistically significant, and therefore this result was subject to doubt. In the case of size of cultivated land, the contribution of this variable to overall inequality through farm income was relatively substantial across the livelihood clusters, but it was more obvious among farmers who are highly specialized in farming (cluster 1).

The contribution of human capital to overall inequality through non-farm income was most obvious for households with specialization in non-farm employment. Among the human capital variables, the contribution from the average education of working members to the inequality in cluster 3 was the highest (17.3 percent) followed by the number of working members (11 percent). The importance of education was relevant because higher education will enable households to participate in higher-return non-farm employment, thus providing higher income to those who had access to these employment opportunities. Natural capital, which was represented by size of cultivated land and the percentage of land owned, had an inequality decreasing effect for households in cluster 4, who combine farming and non-farm employment. Financial capital had a relatively high contribution to the inequality in the income of households in clusters 2 and 4.

The next chapter summarizes the major results related to the research questions and hypotheses presented in Chapter 1.

CHAPTER 7

SUMMARY OF FINDINGS, CONCLUSION AND POLICY IMPLICATIONS

The research area is characterized by households who are vulnerable to climate changes, which affects their agricultural production, in particular paddy yield (Md. Mahmudul, et al., 2011). This has resulted in income fluctuations despite the subsidies provided by the government as the amount of support received is partly based on paddy yield. Therefore, farm households in granary areas are currently involved in non-farm income-generating activities in order to supplement their farm income. As rural households continue to participate in non-farm employments there will also be issues related to the distribution of income. It has been acknowledged in previous studies that if the benefits from non-farm employment are concentrated among the poor and low income households then non-farm income would reduce income inequality. Conversely, the concentration of such benefits among the non-poor households would increase inequality. This study was designed to examine the income diversification of rural households and to analyze the effect of non-farm income on overall income distribution.

This final chapter addresses the pertinent outcomes and generalizations of the research findings. The results are considered in the light of the research questions and objectives which were presented in Chapter 1. For a systematic presentation, this chapter is organized into five sections: 1) summary of findings; 2) conclusions; 3) theoretical implications; 4) policy implications; and 5) implications for future research.

7.1 Summary of findings

Data for the study was gathered from 359 farmers who were randomly selected from the Northwest Selangor IADA. Reliability, frequency tabulations, analyses of variance, product-moment correlation, cluster analysis, multinomial logistic regression,

OLS and Tobit regressions were used to analyze the data. Based on the analyses performed, a summary of the research findings is presented below.

Household participation in non-farm income activities can be considered as a rational behavior from the utility-maximization perspective. This is especially true if the expected returns from labor or investment in non-farm activities are higher compared to those from agricultural activities or if non-farm income results in a more stable household income. Rural households are mainly involved in non-farm activities in the field of management, government agency employments, sales and services, food and accommodation as well as construction. Participation in high-return non-farm wage employment is comparatively high for households in the high and middle income group. Therefore, in this study, household participation in non-farm activities was a form of ex-ante risk management strategy. These non-farm activities represented choices among opportunities and it is a process of strategic resource allocation planning. Conversely, the low income group had the lowest participation in both low and high-return non-farm activities. Furthermore, almost 50 percent of households in the low and medium income groups are involved in low-return agricultural-wage employment. This implies a survival-led diversification strategy for these households, ex-post risk management, or coping strategy.

None of the households in the sample has a monthly income below the national poverty line income (RM800 per month as of 2010). More than 71 percent of these farmers were found to be involved in diversification. However, farming is still the primary occupation to a majority of the farmers, accounting for 67 percent of total household income. This is followed by incomes from non-farm wage employment (18 percent) and agricultural-wage employment (7 percent). Participation in non-farm wage employment is, however, lower compared to agricultural-wage employment. Out of 359

households only 32 percent are involved in non-farm wage employment especially in sales and services as well as management-type work in the public and private sector, while 36 percent are involved in agricultural-wage employment by providing agricultural services to local farmers. In terms of non-farm self-employment income, only about 9 percent of the sample have income from this activity.

Households in the high and middle income groups have greater participation in non-farm employment and hence have a higher share of non-farm income. This suggests that there is greater specialization among these households. In addition to farm income, agricultural-wage income is more important to households in the low income group as this income source represents a relatively higher share in the income of these households. Furthermore, there is also a higher share of households specializing in farming and agricultural-wage employment among these households.

The share of farm income increases as one moves down the income distribution, with the low income group having the highest share of farm income (84 percent). Conversely, the share of non-farm income decreases with the same movement, with households in the high income group having the highest share of non-farm income (43 percent), while households in the low income group have only about a 9 percent share. This shows that there are significant differences in the income diversification decisions between the low and high income groups.

Four livelihood clusters were identified through the use of cluster analysis. The livelihood clusters are: highly-specialized in farming (cluster 1), farming and agricultural-wage employment (cluster 2), specialization in non-farm employment (cluster 3), and finally, farming and non-farm employment (cluster 4). These clusters were found to be significantly different in terms of percapita monthly income. Households in livelihood clusters that combine farming and non-farm employment

(clusters 3 and 4) have higher monthly percapita income compared to those who are highly specialized in farming and those who combine farming with agricultural-wage employment. More specifically, households in cluster 3 have the highest level of monthly income compared to households in the other three livelihood clusters due to their specialization in non-farm employment. In terms of percentage share of farm income, households in cluster 1 have the highest share. Households in cluster 2 have the highest share of agricultural-wage income, while households in cluster 3 have the highest share of non-farm income in their total income (60 percent).

The results from the multinomial logistic regression of livelihood selection reveal several important observations. The first important observation concerns the diversification into non-farm employment. The results confirm that the selection of a livelihood strategy is determined by a household's assets. The second observation is that the size of cultivated land has a significant negative effect on the selection of a diversified livelihood strategy. The third observation is that in selecting the most remunerative livelihood cluster, the household size, the number of working members, and the average education of these working members are significant determinants. This implies that higher education is a form of barrier to the selection of more remunerative livelihood clusters. The fourth observation concerns the influence of financial capital, in particular other non-farm incomes, and access to credit on livelihood activity choices. Financial constraints are also a form of barrier for entering into more profitable strategies which include non-farm activities. The final observation is the significance of having farm equipment that enables farm households to choose a livelihood strategy that combines farming and agricultural-wage employment.

Households in the "highly-specialized in farming" cluster have the lowest level of average education for their working members, owned about 66 percent of the

cultivated land, and have a much lower average value of agricultural implements. Households who combine farming and agricultural-wage employment have the highest value of farm implements which has enabled them to supplement their household income with agricultural-wage income, hence the substantial share of agricultural-wage income (29 percent) for these households. Conversely, households specializing in non-farm employment have the largest household size, highest number of working members, and the highest level of average education for their working members. However, these households also have the smallest size of cultivated area. Finally, households who combine farming and non-farm employment have the largest size of cultivated area. The mean educational years of their working-age members, on the other hand, is higher compared to those in cluster 1, hence a greater contribution of non-farm labor income to their total income.

In summary, the above observations highlight the fact that livelihood strategies that include non-farm activities are more lucrative than farm-dominated strategies (clusters 1, 2, and 4). But why do households with farm-dominated strategies not shift to more rewarding activities? There are a few significant factors that may impede this shift. It was found that the number of working household members with higher education is more likely to pursue non-farm activities, in particular the more remunerative non-farm activities. The liquidity constraints would limit a household's potential investment in profitable off-farm or non-farm income-generating activities.

From the OLS and Tobit regressions, positive significant relationships were observed between percapita income and age of household head, household size, number of working members, average education of working members, size of cultivated land, social capital, as well as household location. Significant positive relationships were observed between percapita farm income and household size, size of cultivated land, the

proportion of land owned, borrowing experience, the value of farm equipment owned as well as social capital. For percapita agricultural-wage income, significant relationships were observed with number of working members, average education of working members, size of cultivated land, the value of farm equipment owned, social capital, as well as household location. Significant relationships were observed between percapita non-farm wage income and household size, number of working members, average education of working members as well as household location. Finally, significant relationships were also observed between percapita non-farm self-employment income and number of working members, borrowing experience, social capital, as well as household location with significant negative relationship with the number of working members.

In terms of significant determinants of income levels and income shares of each income source, it was found that factors affecting income shares may be different from factors affecting income levels. As an example, the average education of working members, the share of other non-farm income and the amount of time taken to reach the closest rural town, were found to be not significant on the level of farm income but they were found to be significant to the share of farm income. For agricultural-wage income, the household size variable became significant in the income share estimation. In addition, the average education of working members was negatively significant in the level of agricultural-wage income but was found to be positively significant on the share of agricultural-wage income. Other variables were also found to be significant in the level but not in the share of agricultural-wage income such as size of cultivated land and household location. Only the size of cultivated land was the additional significant factor to the share but not the level of non-farm wage income. Finally, for non-farm self-employment, the value of farm equipment owned, and the time taken to reach the closest rural town were found to be significant to the share and not the level of income.

In addition, variables such as the number of working members and social capital which were significant for the level of non-farm self-employment income were, however, not significant for the income share.

The differences in the significance of variables affecting the levels and shares of different income sources suggest the importance of identifying these variables as policy instruments in the achievement of policy targets, in particular those that are relevant to income level or income share targets. If the policy target is to increase the income level of rural households, for example, then the target variables should be the significant factors affecting income level. However, if the policy objective is to increase the proportion of non-farm income in the total income of rural households, for instance, then significant income share variables should be the policy variables to be considered.

The Gini coefficient for overall inequality is 0.400 but without non-farm income the Gini coefficient is lower with 0.382, suggesting that non-farm income is an inequality increasing source of income. This is partly due to greater participation of high and medium income households in non-farm wage employment. The largest contributor to overall inequality is farm income (59 percent) while non-farm income contributes only 36 percent. Among the two farm income sources, paddy income is the highest contributor (49 percent), while for non-farm income; the main contributor to overall inequality is non-farm wage income with 26 percent. In general, all non-farm income sources are inequality-increasing incomes except for remittances and transfers, while farm and agricultural-wage incomes are inequality decreasing-income sources.

In the analyses of inequality by livelihood clusters, it was found that households in clusters 3 and 4 who combined farming with non-farm employment had more unequal distributions of income with Gini coefficients of 0.385 for cluster 3 and 0.362 for cluster 4. The Gini coefficient was higher for cluster 3 as households in this cluster

derive most of their income from non-farm wage employment (60 percent). The source Gini coefficients for non-farm income were also lower for these two clusters compared to those of clusters 1 (highly specialized in farming) and 2 (farming and agricultural-wage employment). The lower source Gini for non-farm income was due to greater participation of households in the two clusters in non-farm employment; hence the more equally distributed non-farm income.

In the decomposition of overall inequality by household assets, human capital was the largest contributor to overall inequality through its effect on the inequality of both non-farm wage and non-farm self-employment incomes. The specific human capital variables, in order of importance, for non-farm wage income inequality were the number of working members (16 percent) and the average education of working members (11 percent), while for non-farm self-employment inequality; it is household size and the number of working members. Other important contributors to the inequality in non-farm wage income were household location, size of cultivated land, proportion of land owned and the value of farm equipment owned.

In addition to household size and number of working members, other asset variables that were important to the inequality in non-farm self-employment were the proportion of land owned, the size of cultivated land, borrowing experience, share of other non-farm income, the value of farm equipment owned and household location. The size of cultivated land had an inequality decreasing effect on non-farm self-employment income inequality, while the proportion of land owned increases the inequality in this income source. The value of farm equipment owned decreased the inequality in both sources of non-farm incomes. Among these variables, only the number of working members, average education of working member and household location are significant to the level of non-farm wage income, while for non-farm self-

employment income the significant variables are the number of working members, borrowing experience, and household location. This implies that any changes in these variables would have a significant effect on both the level of income and the inequality in both of these non-farm incomes.

In terms of overall inequality, as a fraction of the explained inequality (s_k), the size of cultivated land (8.6 percent), average education of working members (7.5 percent), number of working-age labor (4.6 percent), proportion of land owned (3.9 percent) and borrowing experience (3.5 percent) were the major contributors to overall inequality. However, when looking at specific sources of income, it was found that the size of cultivated land, the proportion of land owned and borrowing experience were mostly contributing to inequality through farm income, while average education of working-age labor and the number of working members are mostly contributing to overall inequality through non-farm labor income.

Results from the analysis on the contribution of household assets to inequality by livelihood clusters showed that the contribution of total cultivated land and the proportion of land owned to income inequality through farm income were most pronounced among highly specialized farm households, those that combine farming and agricultural-wage employment as well as those that combine farming and non-farm employment. This is relevant because households in these clusters derive a majority of their income from farming. The size of cultivated land coefficient in the farm income-generating equations for each of these clusters was also significant. However, the proportion of land owned was not statistically significant in the farm income equation for cluster 4 and therefore this result is subject to doubt.

In the case of average education of working members and the number of working members, the highest contributions of these variables to inequality through

non-farm income are most obvious among households specializing in non-farm employment. The coefficient for these variables in the non-farm income-generating equation was also significant for households in cluster 3. As for household access to credit its contribution to inequality through farm income is the largest among highly specialized farm households and those that combine farming and agricultural-wage employment. This was expected because households in these clusters have been found to utilize credit for the purchase of farm inputs and the coefficient for borrowing experience was also statistically significant in the farm income equations for clusters 1 and 2.

7.2 Conclusion

At early stages of development, higher investment in the agricultural sector is crucial to the achievement of income growth, poverty reduction, and food security. However, as an economy develops, the role of the non-farm sector becomes more significant to rural development as more non-farm employment opportunities are made available to rural households.

The allocation of assets to specific income generating activities is an indication of increasing specialization of households in a given income generating activity. An important observation from the analysis of household selection of a livelihood cluster was the need to reduce constraints to participation in non-farm employment. Another important observation is the importance of farm income, particularly for the high and medium income households.

Diversification may function as a strategy for risk management and overcoming market failures. It may also represent specialization with the household deriving income from individual attributes and comparative advantage. Households with highly educated working members, for example, may be involved in diversification as a form of

specialization. This would imply that the younger family members will be participating in non-farm activities. In this condition, diversification may reflect a transition period as these household members moves out of farm activities. This also indicate that diversification can be into low and high return activities which reflects the pull and push factors and reflects a pathway out of poverty or survival strategy.

The analysis of the income generating activities of rural households in the study area showed the existence of diversification across rural households. Diversification, not specialization, is the norm among rural households, although households in the study areas are heavily involved in agricultural activities. There is also some level of specialization in non-farm activities as well. Income from paddy cultivation will remain critically important for rural livelihoods in granary areas, both in terms of the overall share of farm income as well as the large share of households that continue to specialize in paddy cultivation.

The nature of diversification will vary by household. Overall, households in the high and medium income groups had a higher level of participation in, and greater share of income from non-farm activities. Consequently, these households had a larger share of specialization into non-farm wage activities. Conversely, farm income sources were generally most important to low income households. Income from crop activities, as well as from agricultural-wage employment, represents a higher share of total income for the low income group. An opportunity-led diversification strategy had been identified as part of a growth strategy and is a response to evolving markets and technological advancement that have increased worker productivity, hence household income. This type of strategy is common among high and medium income households.

Given this trend of diversification, non-farm sources of income will have an effect on the distribution of rural income. In general, non-farm income was found to

increase overall inequality, and in terms of magnitudes, non-farm wage income accounted for the largest share of income inequality in the study areas, followed by non-farm self-employment income. These results were also uniform among livelihood clusters. Farm households who derive their incomes from the combination of farming and non-farm employment had a more unequally distributed higher percapita income.

7.3 Theoretical implications

The assumptions of the standard agricultural household model are applicable to the study areas due to the availability of a functioning labor, agricultural input, and product as well as credit markets. Its basic principles are also valid in that the households were both production and consumption units, and the decisions concerning resource allocation, production and consumption were inter-related. The sustainable livelihoods framework (SLF) had provided an analytical tool in various income diversification studies. The emphasis of the framework is on household asset endowments, as well as the processes, trends, institutions and organizations affecting a household's livelihood, as these are important factors affecting the potential choices of income-generating activities. In this study the household asset endowments were used as independent variables in the econometric equations for analyzing the determinants of income levels and shares of various income sources, as well as the selection of a livelihood cluster.

Only a few of the household assets have been found to be statistically significant. This implies that focus should also be provided to other components of the sustainable livelihood framework such as the availability of employment opportunities, the mediating processes, and structures as well as the entry barriers to various income activities. It also suggests that there is greater heterogeneity in each income activity. This raises some questions for further research.

Locational capital was included as a separate asset, rather than being grouped under physical asset, as suggested by the SLF. This is to reflect the importance of this asset in the Malaysian rural context. It will also ensure that the livelihood analysis would consider how locational asset, which is an asset that is not affected by household decisions, relates to the livelihoods in terms of livelihood strategies and incomes.

7.4 Policy implications

In light of the above findings, the following policy implications can be drawn with respect to income diversification and the distribution of income. Although the inequality decomposition was only able to explain a relatively small proportion of inequality but the results can be used for policy analysis. This is because the study was able to explain the parts that are related to important policy variables such as education and landholdings. These variables are related to inequality in income sources and opportunities and are relevant for policy makers.

The results suggest that the income diversification of rural households clearly indicate the need to look beyond agriculture in rural development policies. The low participation of low income households in non-farm activities suggests that the promotion of rural non-farm activities ought to constitute a key component of any rural development strategy. In particular, this strategy should take into account the local economic context of rural areas and the asset conditions of rural households. Policy makers must also consider the possibility for any intervention with the likelihood of creating barriers to entry. This may limit the ability of low income households to take advantage of non-farm employment opportunities, especially the most remunerative, which would result in the worsening of inequalities. The links between certain assets and activities imply that due consideration must be given to those assets, or combination of assets, which will ensure broad growth in the rural economy. This complexity means

that a particular policy is unlikely to fit different situations across households in different granary areas and that location specific policies are necessary.

The analysis of livelihood strategies was designed to enable an investigation of the determinants of a household selection of a livelihood cluster. The combination of household asset endowments and activities reflects a household's income diversification behavior. The descriptive analysis on the distribution of households in each livelihood cluster according to income groups showed that households who were in the highly specialized in farming cluster were mostly in the low income group. They were more vulnerable due to their greater reliance on farm income compared to households in other clusters. Furthermore, they also had lower resource endowments compared to households in the other three clusters. Although they may have greater need for non-farm income, they are also the most constrained. Low income households, because of their lower endowment of human capital had fewer opportunities to participate and derive income from non-farm employment. Therefore, the promotion of any potential non-farm activities through any policies or projects which are aimed at increasing the income level of low income households, have to first be evaluated. This is to determine their suitability with the assets of low income households. The failure to properly evaluate the promoted non-farm activities will not enable greater participation of low income households. Furthermore, it will not be able to increase the income of these households through the promotion of non-farm activities.

Total cultivated land is one of the contributors to income inequality mainly through farm income and for those who also have agricultural-wage income. The availability of a land market which enabled farmers to buy, rent or be involved in share-cropping arrangements, may lead to unequal distribution of cultivated land. In view of

this possible scenario, income inequality could further increase if the inequality in total cultivated land starts to increase.

The role of education in contributing to inequality through non-farm labor income should not be overlooked. The inequality decomposition results imply that non-farm labor income is an inequality increasing source of income and that the increasing tendency of farm household members to work off the farm could increase income inequality. The government's education policy has resulted in equitable access to formal education for the Malaysian population. However, another aspect of education, which is training, is crucial for the development of rural enterprises. Rural household participation in non-farm self-employment, especially in skill-based business enterprises could provide higher returns even to low income households. With greater participation of this group of households into the non-farm sector, non-farm income may turn into an inequality decreasing source of income.

Family composition, in particular, the number of working members, contributes to income inequality mostly through non-farm labor income inequality. Over the years, the extent of participation of Malaysian rural households in the non-farm sector has increased remarkably. While there is not much impact of policy on family composition, it should be noted that to the extent that the Malaysian farm households are multi-generational, the tendency of a farmer's children to join their parents on the family farm depends largely on their employment opportunities. With this family structure, there will be more adult children in the family, which may result in a higher fraction of adult family members participating in non-farm employment, and this process could lead to increased income inequality in the long run. To counteract this effect, policies should be designed to make rural non-farm employment opportunities more available, especially

to low income households. This would also contribute towards the reduction of migration of younger household members to urban areas.

Another important area of concern is the income derived from farming and non-farm self-employment. The econometric analysis shows that a household's borrowing experience positively influences the level and share of farm and non-farm self-employment incomes. Borrowing experience was shown to be statistically significant to a household's selection of livelihood clusters that combined farming and non-farm employment as well as farming and agricultural-wage employment. The positive influence of borrowing money suggests that such loans are used to increase land productivity and for investment in business enterprises. However, due to the age limitation of the head of households and the lack of collateral, they have lesser borrowing experience. Nonetheless, the availability of adult children in the family would provide the household with greater possibility of borrowing funds. The number of adult children, who are considered as part of the household, however, is very dependent on the availability of employment opportunities in the rural areas. Therefore, this is also related to the implementation of policies that is intended for the creation of more non-farm employment opportunities. This would increase the demand for higher educated working-age labor especially in the private sector.

Non-farm activities represent an alternative source of income without having to leave farming. The analysis of household participation by activity found that self-employment activities were dominated by small enterprises or businesses serving local markets. This implies the existence of linkages between the agricultural and non-agricultural sector. The businesses of shop keepers, workshops, and restaurants, for example, were dependent on the economic situations of farmers in the study areas. The continuation of a two-pronged rural development strategy which focuses on rural

development programs for both the farm and non-farm sectors is crucial as it would create greater non-farm employment opportunities in the study areas. This would increase the demand from local farmers and represent an advantage to the existing local businesses. This type of dependence requires multi-sectoral development policies that would take into consideration the multiplicity of activities and their inter-linkages.

7.5 Implications for future research

In the course of the literature reviewed as well as the actual research and analyses, a number of themes for future research have been identified.

Similar research should be conducted in other IADAs and/or other agricultural areas especially those that are located in less developed states in Malaysia where poverty is still a problem. Other paddy growing areas may have farmers who consume part of their paddy production. As a consequence, imputation has to be made on the value of this home consumed rice in order to avoid under-estimating the farm income. Other agricultural areas may have other crops other than paddy, such as oil palm. This would enable the integration of livestock, hence providing households with additional agricultural income source. These different rural settings will allow the determination of possible livelihood clusters among households and the significant household assets that are responsible for the selection of livelihood strategies in greater diversity in farm and non-farm incomes. In these areas, however, the focus should be on issues related to poverty rather than inequality.

Another topic for further research would be the need for a more in-depth study of this nature by incorporating other household asset variables that are not included in this study. This is to further enhance the identification of factors that affect farmers' participation in non-farm activities. The agricultural household model and econometric methods provide an appropriate basis for the discussion and analysis of the determinants

of rural income generation and diversification. The rural livelihoods framework also reveals other important determinants of income diversification other than household assets and they would deserve more attention. An example would be the inclusion of existing rural institutions and public as well as private organizations and structures. This would provide a better understanding of the rural households' operating environment and their income-generation potential.

A study of this nature should also be carried out over a period of time through the use of longitudinal and panel data. This is to enable the determination of the trend of rural household participation in non-farm activities overtime, which would allow one to look at how the livelihood strategies of rural households in general or a group of rural households have changed as the rural economy develops. The use of these data would also enable the inclusion of seasonal changes, especially those that represent negative shocks to paddy production, into the analyses of livelihood strategy. The study on the change in the contribution of farm and non-farm incomes in total household income will enable the analysis of inequality that is associated with changes in income sources and household assets such as land distribution and education. This type of analysis will indicate how the non-farm income distribution has changed overtime and allows the determination of the change in the influence of specific assets on inequality. Some of the relevant questions would include: How has the inequality in the distribution of cultivated land affected overall inequality? Have there been any other household assets that have exerted a greater influence on overall inequality?

The understanding of intra-household decision-making would enable better targeting of policy instruments. However, the only labor allocation information that was collected in this study is the number of hours allocated to rice production per week. Other information on labor allocation to other income generating activities by other

working household members was not collected. Therefore, there is a need to study labor usage by household members as it will enable the analysis of returns from each activity.

A household's attitude towards risk is assumed to affect its diversification decisions. Therefore, the risk factor should be included in future analyses. This is to be achieved by developing a system for measuring a household's attitude and behavior towards risk. One suggestion would be to collect information on a household's consumption pattern.

Continuous participation of rural households in the non-farm sector could have serious consequences on rural income inequality. This would eventually lead to a worsening of overall inequality. Therefore, studies on rural income distribution should take into consideration the effect of non-farm income on income distribution. Efforts should be made to look at the change in participation of rural households in the middle 40 percent and bottom 40 percent income groups in non-farm activities. Greater participation of households in the bottom 40 percent group may result in lower rural inequality if they are able to participate in higher return non-farm activities. If they are only found in low return non-farm activities, this implies that there are significant barriers for these households.

Given the existence of both low and high return rural income-generating activities with different entry barriers, comparative studies should be carried out to determine the relationship between rural income-generating activities or participation in rural non-farm employment and poverty. This is because studies of this nature have found that the poor may not necessarily have a lower share of income from non-farm activities compared to the non-poor. Malaysian paddy farmers are operating in granary areas that are located in states with different levels of economic development. Selangor, in which the Northwest Selangor IADA is located, is one of the developed states in

Malaysia. Therefore, there are greater non-farm employment opportunities for rural households including paddy farmers and their family members. However, for farmers who are operating in granary areas that are located in less developed states such as Kedah and Kelantan, they may have lesser access to non-farm employment opportunities. Furthermore, this would have consequences on the households' ability to move out of poverty.

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Reliability

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
.816	.824	14

Item-Total Statistics

Social capital construct	Scale Mean if Item Deleted	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Benefits gained from membership	80.50	0.03	0.897
Membership in formal & informal organization or association	80.08	0.496	0.793
Similarity among group members	79.99	0.491	0.791
Ability to get support from family and relatives	80.02	0.495	0.793
Ability to get support from those other than family members and relatives	80.03	0.561	0.789
Most people in the community can be trusted	79.82	0.503	0.805
Most people in the community always help each other	79.82	0.557	0.803
Most of the community contribute time and effort towards common development goals	80.05	0.593	0.792
High likelihood that people in the community cooperate to solve common problems	80.04	0.508	0.791
Frequently listen to the radio	80.04	0.411	0.794
Frequently watched television	80.04	0.569	0.791
Frequently read newspaper	80.03	0.503	0.792
Strong feeling of togetherness in the community	79.77	0.569	0.804
The community has substantial differences in terms of wealth, income & social status	79.84	0.56	0.805
Feeling safe from crime & violence when alone at home	79.78	0.711	0.801
Have control in making decisions that affect everyday activities	79.97	0.745	0.788
Local government & agencies always consider community opinion	79.94	0.684	0.789

Appendix B

Serial No.
No. Siri ☐

Household questionnaire

Borang Soal-Selidik Isi Rumah

Livelihood Strategies of Farm Households and Distributional Consequences

Strategi Kehidupan Isi Rumah Petani dan Kesan ke atas Agihan Pendapatan

1. Basic information
Maklumat Asas

Date of survey: _____ Block: _____
Tarikh kaji selidik *Blok*

Village Name: _____
Nama kampung

Area: (1) Panchang Bedena (2) Bagan Terap _____
Kawasan

Name of household head: _____
Nama ketua isi rumah

Name of respondent: _____
Nama responden

1.1 Household background information (Human capital)

Maklumat latar belakang isi rumah

Name (*Nama)* List all household members living in this house *Senaraikan semua ahli yang tinggal di rumah ini*	**Relationship with household head** ***Hubungan dengan ketua isi rumah*** Code *(Kod) 1*	**Gender** ***Jantina*** 1 = Male (*Lelaki)* 2 = Female (*Perempuan)*	**Age** ***Umur*** Year *(Tahun)*	**Marital status** ***Taraf Perkahwinan*** Code *(Kod) 2*	**Level of highest formal education** ***Taraf pendidikan rasmi tertinggi*** Code *(Kod) 3*	**Main Occupation** ***Pekerjaan Utama*** Code *(Kod) 4*
1.	Household head *Ketua isi rumah*					
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Please refer to the codes provided in the following page

Sila gunakan kod yang diberikan di muka surat seterusnya

List of codes
Senarai kod

Code (*Kod*) 1	**Code (*Kod*) 2**	**Code (*Kod*) 3**	**Code (*Kod*) 4**
1 = Wife/husband *1 = Isteri/suami*	1 = Single *1 = Bujang*	0 = No schooling *0 = Tidak pernah bersekolah*	1 = Self-employed in own farm plots *1 = Bekerja di tanah milik sendiri*
2 = Children *2 = Anak*	2 = Married *2 = Berkahwin*	1 = Primary school (6 years) *1 = Sekolah rendah (6 thn)*	2 = Self-employed in non-farm activities *2 = Bekerja sendiri di luar bidang pertanian*
3 = Father/mother *3 = Ayah/ibu*	3 = Others *3 = Lain-lain*	2 = SRP/PMR/completed form 3 (9 years) *2 = SRP/PMR/tamat tingkatan 3 (9 tahun)*	3 = Daily casual worker in agriculture 3 = Pekerja harian dalam bidang pertanian
4 = Grandchildren *4 = Cucu*		3 = SPM (11 years) *3 = SPM (11 tahun)*	4 = Daily casual worker in non-agricultural activites *4 = Pekerja harian dalam bidang bukan pertanian*
5 = Grandfather/grandmother *5 = Datuk/nenek*		4 = STPM/certificate (13 years) *4 = STPM/Sijil (13 tahun)*	5 = Salaried worker in agricultural employment *5 = Pekerja bergaji tetap dalam bidang pertanian*
6 = Mother- / father in-law *6 = Mertua*		5 = Diploma (14 years) *5 = Diploma (14 tahun)*	6 = Salaried worker in non-agricultural employment *6 = Pekerja bergaji tetap dalam bidang bukan pertanian*
7 = Other relatives *7 = Saudara lain*		6 = Bachelors degree (16 years) *6 = Ijazah Sarjana Muda (16 tahun)*	7 = Mother/housewife *7 = Ibu/suri rumahtangga*
8 = Maid *8 = Pembantu rumah*			8 = Student *8 = Pelajar*
9 = Son- / daughter in-laws *9 = Menantu*			9 = Unemployed but looking for work *9 = Penganggur – sedang mencari pekerjaan*
10 = Brother/Sister *10 = Abang/Kakak/Adik*			10 = Unable to work (handicapped & others) *10 = Tidak mampu bekerja (cacat & lain-lain)*

1.2 Training information
Maklumat latihan

Have you or any family member participated in any training in agriculture and/or non-agriculture during the last three years (2008 – 2010)?

Pernahkah anda atau ahli keluarga menyertai sebarang latihan dalam bidang pertanian dan bukan pertanian dalam tempoh tiga tahun terkini (2008 – 2010)?

1 = Yes (*Ya*) 2 = No (*Tidak*) _____

If 'yes', please select (√) the following type of training (you may choose more than one):

Sekiranya 'Ya', sila tandakan (√) untuk jenis latihan berikut (boleh tandakan lebih dari satu):

Type of training ***Jenis Latihan***	**Household members** ***Ahli Isirumah***		
	Head of household ***Ketua isi rumah***	**Wife** ***Isteri***	**Others** ***Lain$_2$***
Food processing entrepreneurship skill *Kursus Keusahawanan Kemahiran Pemprosesan Makanan*			
Agricultural certificate *Kursus Sijil Pertanian*			
Farm youth entrepreneurship incubator program *Program Inkubator Usahawan Belia Tani*			
Farmer and entrepreneurship course *Kursus Petani dan Usahawan*			
Malaysia workmanship certificate program *Program Sijil Kemahiran Malaysia*			
Machinery operator and maintenance course *Kursus opearator dan penyelenggaraan jentera*			
Crop management course *Kursus pengurusan tanaman*			
Paddy yield improvement course *Kursus peningkatan hasil padi*			
Marketing network course *Kursus jaringan pemasaran*			
Others (please state) *Kursus lain (sila nyatakan)* _____ _____			

2.0 Information on household income
Maklumat pekerjaan isi rumah

2.1 Income of working household members
Pendapatan bagi isi rumah yang bekerja

Type of employment *Jenis Pekerjaan*	**Head of household** *Ketua isi rumah*	**Wife** *Isteri*	**Other members** *Lain$_2$ ahli isi rumah*
AGRICULTURE: ***PERTANIAN:***			
1) Paddy cultivation *Penanaman paddy:* a) Total hours per day *Jumlah jam sehari*			
b) Income (RM/season) *Pendapatan (RM/musim)* i) Main season *Musim utama* ii) Off-season *Luar musim*			
2) Other crops (RM/month) *Tanaman lain (RM/bulan)*			
3) Livestock (RM/month) *Ternakan (RM/bulan)*			
4) Agricultural services (RM/month) *Perkhidmatan pertanian (RM/bulan)*			
NON-AGRICULTURE: ***BUKAN PERTANIAN:***			
1) Management (business) (RM/month) *Pengurusan (perniagaan) (RM/bulan)*			
2) Clerical (RM/month) *Perkeranian (RM/bulan)*			
3) Government employee (please state) (RM/month) *Penjawat awam (sila nyatakan) (RM/bulan)* _____			
4) Technician (RM/month) *Juruteknik (RM/bulan)*			
5) Sales & services (RM/month) *Jualan & perkhidmatan (RM/bulan)*			
6) Craft & tourism/homestay (RM/month) *Kraf & pelancongan/inap desa (RM/bulan)*			
7) Factory & machine operators (RM/month) *Operator kilang & mesin (RM/bulan)*			
8) Food production (RM/month) *Pengeluaran makanan (RM/bulan)*			
9) Construction (RM/month) *Pembinaan (RM/bulan)*			

2.2 Information on self-employment income
Maklumat pendapatan dari hasil kerja sendiri

2.2.1 Do you have any additional income from non-farm self-employment activities?
Adakah anda memperolehi tambahan pendapatan sendiri dari luar bidang pertanian?

1 = Yes *(Ya)* 2 = No *(Tidak)* _____

Activity information ***Maklumat aktiviti***	
Type of activity (Code 1) *Jenis aktiviti (Kod 1)*	
Ownership status (Code 2) *Status pemilikan (Kod 2)*	
Year started *Tahun dimulakan*	
Average profit (RM/month) *Purata keuntungan (RM/bulan)*	
Main problem (Code 3) *Masalah utama (Kod 3)*	

Code (*Kod)* 1
1 = Stall *(Warung)*
2 = Restaurant *(Restoran)*
3 = Boarding *(Penginapan)*
4 = Workshop *(Bengkel)*
5 = Grocery store *(Kedai runcit)*
6 = Others *(Lain-lain)*

Code (*Kod)* 2
1 = Own *(Milik sendiri)*
2 = Rented *(Sewa)*
3 = Worker *(Pekerja)*

Code (*Kod)* 3
1 = No major problem (*Tiada masalah serius)*
2 = Lack of demand *(Kekurangan permintaan)*
3 = Shortage of workers (*Kekurangan tenaga kerja)*
4 = Lack of inputs (*Kekurangan input)*
5 = Management problem (*Masalah pengurusan)*
6 = Management problem related to family matters (*Masalah urusan berkaitan keluarga)*
7 = Lack of capital (*Kekurangan modal)*

2.2.2 If you have your own business, what is the main source of your start-up capital?
Sekiranya anda mempunyai perniagaan sendiri, apakah sumber modal utama untuk memulakan perniagaan?

Source (*Sumber)*	**Response** ***(Respon)*** 1 = Yes *(Ya)* 2 = No *(Tidak)*
a) Savings (*Wang simpanan)*	
b) Loans (*Pinjaman)*	
c) Inheritance *(Harta warisan)*	
d) Relatives *(Saudara-mara)*	
e) Combination from various sources *(Kombinasi pelbagai sumber)*	

2.2.3 Reason for involvement in non-farm activities
Tujuan penglibatan dalam aktiviti bukan pertanian

Why caused to be involved in economic activities other than agriculture?
Apakah yang menyebabkan anda melibatkan diri dalam aktiviti ekonomi selain daripada bidang pertanian?

Reason for involvement ***Sebab penglibatan***	**Respon** 1 = Yes *(Ya)* 2 = No *(Tidak)*
a) Non-farm employment is main source of income. *Pekerjaan dalam bidang bukan pertanian adalah sumber pendapatan utama.*	
b) Agricultural jobs do not require much time. *Kerja-kerja pertanian tidak memerlukan masa yang banyak.*	
c) The availability of agricultural service providers with affordable costs. Terdapat pengusaha yang menyediakan perkhidmatan pertanian dengan bayaran yang berpatutan.	
d) As a source of additional income *Sebagai sumber pendapatan sampingan.*	
e) To cover expenses during seasons with low yields. *Untuk menampung perbelanjaan dalam musim hasil pengeluaran yang rendah.*	
f) As a source of savings. *Sebagai sumber simpanan.*	
g) Have suitable inputs for non-farm activities. *Mempunyai input yang sesuai untuk aktiviti bukan pertanian.*	
h) Availability of loans for business purposes. *Terdapat kemudahan pinjaman untuk tujuan perniagaan.*	

2.3 Other source of household income
Sumber pendapatan lain isi rumah

Other income sources ***Sumber pendapatan lain***	**Income** ***Pendapatan***
A) PROPERTY INCOME (RM/month): ***PENDAPATAN DARIPADA HARTA (RM/bulan):*** i) Agricultural land rental *(Sewa tanah pertanian)*	
ii) Housing rentals (Sewa rumah)	
TOTAL PROPERTY INCOME (RM) ***JUMLAH PENDAPATAN DARIPADA HARTA (RM)***	
B) TRANSFER PAYMENTS (RM/month) **BAYARAN PINDAHAN (RM/bulan):** i) Remittance *Bantuan wang yang diterima daripada ahli keluarga*	
ii) Pension *Bayaran pencen*	
iii) Government assistance (PPRT, zakat and others) *Bayaran kerajaan (PPRT, zakat dan lain-lain)*	
TOTAL TRANSFER PAYMENTS (RM) ***JUMLAH PENDAPATAN PINDAHAN (RM)***	

3. Information on household social capital
Maklumat modal sosial isi rumah

Do you or your family members participate in any association, social groups or committees?
Adakah anda dan ahli keluarga anda menyertai sebarang persatuan, kumpulan sosial, atau jawatankuasa?

Yes *(Ya)* _____ No *(Tidak)* _____

a) Number of family members who are members of a association _____.
Jumlah ahli keluarga yang menjadi ahli persatuan _____.

b) Please provide the names of the association.
Sila nyatakan nama-nama persatuan yang disertai.

_____

i) Based on the statement, circle the answer based on the following scale:
Berdasarkan pernyataan, bulatkan jawapan anda mengikut skala berikut:

1	**2**	**3**	**4**	**5**
Strongly disagree *Sangat Tidak Setuju*	Disagree *Tidak Setuju*	Somewhat agree *Sederhana Setuju*	Agree *Setuju*	Strongly agree *Sangat Setuju*

	Members have similarity in terms of: *Ahli kumpulan mempunyai persamaan dari segi:*					
c1i	Village/block *(Kampung/blok)*	1	2	3	4	5
c1ii	Family *(Keluarga)*	1	2	3	4	5
c1iii	Gender *(Jantina)*	1	2	3	4	5
c1iv	Age *(Umur)*	1	2	3	4	5
c1v	Employment *(Pekerjaan)*	1	2	3	4	5
c1vi	Education background *(Latarbelakang pendidikan)*	1	2	3	4	5
c2	My family members and/or I always have meetings with the group (social) in the village or association I'm a member of. *Saya dan/atau ahli keluarga selalu mengadakan perjumpaan dengan kumpulan (sosial) di kampung atau persatuan yang saya sertai.*	1	2	3	4	5
c3	My family members and/or I obtained many benefits from the association /group. *Saya dan/atau ahli keluarga mendapat banyak faedah dari persatuan/kumpulan*	1	2	3	4	5

1	2	3	4	5
Strongly disagree *Sangat Tidak Setuju*	Disagree *Tidak Setuju*	Somewhat agree *Sederhana Setuju*	Agree *Setuju*	Strongly agree *Sangat Setuju*

d1	I can depend on family / relatives / neighbors for help during an emergency. *Saya boleh mengharapkan keluarga / saudara mara / jiran-jiran untuk bantuan dalam masa kecemasan.*	1	2	3	4	5
d2	If I have a problem, there will always be someone to help me. *Jika saya mempunyai masalah, selalu ada orang yang menolong saya.*	1	2	3	4	5
d3	Most of the villagers are honest and can be trusted. *Kebanyakan masyarakat di kampung ini adalah jujur dan boleh dipercayai.*	1	2	3	4	5
e1	The village society always helps one another. *Masyarakat di kampung ini sentiasa membantu antara satu sama lain.*	1	2	3	4	5
e2	The village society always allocates time and energy to village activities. *Masyarakat di kampung ini sentiasa menyumbang masa dan tenaga untuk aktiviti-aktiviti di kampung.*	1	2	3	4	5
e3	The village society always work together to solve problems pertaining involving local villagers. *Masyarakat di kampung ini sentiasa bekerjasama untuk menyelesaikan masalah umum yang melibatkan masyarakat setempat.*	1	2	3	4	5
f1	I always listen to the radio. *Saya selalu mendengar radio.*	1	2	3	4	5
f2	I always watch tv. *Saya selalu menonton televisyen.*	1	2	3	4	5
f3	I always read the newspaper. *Saya selalu membaca surat khabar.*	1	2	3	4	5
g1	There is a degree of loyalty among the village society. *Terdapat semangat setiakawan yang tinggi di kalangan masyarakat di kampung.*	1	2	3	4	5
g2	There is a lot of differences in terms of wealth and social status among the society. *Terdapat banyak perbezaan kekayaan, pendapatan dan status sosial di kalangan masyarakat.*	1	2	3	4	5
g3	My family and I feel safe from crime and violence when are alone in our house. *Saya dan keluarga berasa selamat dari jenayah dan keganasan apabila berada sendirian di rumah.*	1	2	3	4	5
h1	I have the power to make decisions regarding daily activities. *Saya mempunyai kuasa untuk membuat keputusan berkaitan aktiviti harian.*	1	2	3	4	5
h2	The local government and government agencies often listen to the society's opinion. *Kerajaan tempatan dan agensi kerajaan sering mendengar pendapat masyarakat.*	1	2	3	4	5

4. Information on household savings and loans
Maklumat tabungan dan pinjaman isi rumah

4.1 General information
Maklumat am

<table>
<tr><th>QID</th><th>Statement
Pernyataan</th><th>Response code
Kod Respon
1 = Yes (Ya)
2 = No (Tidak)</th></tr>
<tr><td>4.1a</td><td>Have you borrowed any money?
Adakah anda pernah meminjam wang?</td><td></td></tr>
<tr><td>4.1b</td><td>Have you ever provided any loans to other households?
Adakah anda pernah memberikan pinjaman kepada isi rumah lain?</td><td></td></tr>
<tr><td>4.1c</td><td>Do other households provide any loans to your family?
Adakah isi rumah lain memberikan pinjaman kepada isi rumah anda?</td><td></td></tr>
<tr><td>4.1d</td><td>Do you have any savings? If ‘Yes’ please proceed to the following question.
Adakah anda mempunyai simpanan? Sekiranya ‘Ya’ sila teruskan ke soalan berikut.</td><td></td></tr>
<tr><td>4.1e</td><td colspan="2">Please identify the financial institution where you made your savings.
Sila tandakan institusi kewangan di mana anda menyimpan:
<table>
<tr><th>Institutions
(Institusi)</th><th>Response (√)
Respon (√)</th><th>Institutions
(Institusi)</th><th>Response (√)
Respon (√)</th></tr>
<tr><td>Bank</td><td></td><td>Farmer Association
(Pertubuhan Peladang)</td><td></td></tr>
<tr><td>ASB/ASN</td><td></td><td>Cooperatives
(Koperasi)</td><td></td></tr>
<tr><td>Pilgrimage fund
(Tabung Haji)</td><td></td><td>Village savings
(Tabungan dikampung)</td><td></td></tr>
</table></td></tr>
</table>

4.2 Loan information
Maklumat pinjaman

a) If you have ever borrowed money within the last 3 years please complete the following table.
Sekiranya anda pernah meminjam wang dalam tempoh tiga tahun yang lalu sila lengkapkan jadual berikut.

Source of loan ***Sumber pinjaman*** Code (Kod) 1	**Loan usage** ***Penggunaan Pinjaman*** Code (Kod) 2	**Loan frequency** ***Kekerapan Pinjaman*** Code (Kod) 3

Code (*Kod)* 1
1 = Bank *(Bank)*
2 = Credit program from PPK or other government agencies *(Program kredit PPK atau agensi kerajaan lain)*
3 = Cooperatives *(Koperasi)*
4 = Relatives *(Saudara)*
5 = Friends from the village *(Sahabat dalam satu kampung)*
6 = Others living outside of this village *(Orang lain yang tinggal di luar kampung ini)*

Code (*Kod)* 2
1 = To buy necessities *(Untuk membeli barang keperluan)*
2 = To buy agricultural inputs *(Untuk membeli input pertanian)*
3 = To buy non-agricultural inputs *(Untuk membeli input bukan pertanian)*
4 = Health *(Kesihatan)*
5 = Education *(Pendidikan)*

6 = Social functions *(Majlis sosial)*
7 = Land rental *(Sewa tanah)*
8 = Debt repayment *(Membayar hutang)*
9 = Land purchase *(Membeli tanah)*
10 = Land preparation *(Penyediaan tanah)*

Code (*Kod)* 3
1 = Monthly *(Bulanan)*
2 = Not frequent *(Tidak tetap)*
3 = 2-3 times per year *(2 -3 kali setahun)*
4 = Once a year *(Setahun sekali)*
5 = Seldom *(Jarang)*

5. Information on household physical asset
Maklumat modal fizikal isi rumah

5.1 Livestock ownership status
Status pemilikan ternakan

Livestock or animal ***Haiwan Ternakan*** **Code (*Kod*) 1**	**Total livestock/animal owned** ***Jumlah ternakan yang dimiliki***	**Value of livestock/animal sold** ***Nilai jualan ternakan*** **(RM)**

Code (*Kod*) 1
1 =Cows (*Lembu*) 3 = Poultry (*Ayam/itik*)
2 = Goat (*Kambing*) 4 = Others (including fish) *Lain-lain (termasuk ikan)*

5.2 Reason for rearing animals
Tujuan membela ternakan

Reason ***Tujuan***	**Response code** ***Kod Respon*** 1 = Yes *(Ya)* 2 = No *(Tidak)*
Investment (*Pelaburan*)	
To cover family expenditure if crop income is insufficient *Untuk menampung perbelanjaan keluarga sekiranya pendapatan tanaman tidak mencukupi*	
To increase family income *Untuk menambah pendapatan keluarga*	

5.3 Adakah rumah kediaman anda digunakan sebagai sumber atau input untuk perniagaan?

1 = Yes *(Ya)* _____ 0 = No *(Tidak)* _____

5.4 Status of equipment ownership
Status pemilikan peralatan

Do you own any equipment for agricultural and non-agricultural activities?
Adakah anda memiliki peralatan untuk aktiviti pertanian dan aktiviti selain pertanian?

1 = Yes *(Ya)* _____ 0 = No *(Tidak)* _____

If 'Yes', please state the epuipment:
Sekiranya 'Ya', sila nyatakan peralatan tersebut:

List of equipment ***Senarai peralatan***	**Equipment value** **Nilai peralatan** **(RM)**
1.	
2.	
3.	

5.5 Information on public amenities
Maklumat kemudahan awam

Please provide answers to the following statements:
Sila isikan jawapan kepada pernyataan berikut:

No. ***Bil.***	**Statement** ***Pernyataan***	**Response** ***Respon***
1.	What is the distance from your house to the nearest road? (km) *Berapakah jarak dari rumah anda ke jalanraya yang terdekat? (km)*	
2.	What is the distance from your house to the nearest town? (km) *Berapakah jarak dari rumah anda ke pekan yang terdekat? (km)*	
3.	How long does it take for you to reach the nearest town? (minutes) *Berapakah masa yang diambil untuk anda sampai ke pekan tersebut? (minit)*	
4.	How do you get to the nearest town? *Bagaimanakah anda sampai ke pekan tersebut?* 1 = Own transportation (*Kenderaan sendiri*) 2 = Using public transportation (bus, taxis etc.) (*Menaiki kenderaan awam (bas, teksi)*)	
5.	What is the type of public transport that is available in the area? *Apakah jenis kenderaan awam yang terdapat di kawasan ini?* 1 = Bus (*Bas*) 2 = Taxi (*Teksi*) 3 = Bus and taxis (*Bas dan teksi*) 4 = None (*Tiada*) What is the frequency of public transport provision? *Apakah kekerapan kemudahan pengangkutan tersebut disediakan?* 1 = Every 10 minutes *(Setiap 10 minit)* 2 = Every 15 minutes *(Setiap 15 minit)* 3 = Every 30 minutes *(Setiap 30 minit)* 4 = Every 15 minutes *(Setiap jam)*	
6.	How many towns can you reach in a 1 hour trip? *Berapakah jumlah pekan yang boleh ditemui dalam masa 1 jam perjalanan?*	
7.	How many cities can you reach in a 1 hour trip? *Berapakah jumlah bandar yang boleh ditemui dalam masa 1 jam perjalanan?*	

6. Crop information
Maklumat Tanaman

6.1 Information on cultivated area
Maklumat kawasan tanaman

Block ***Blok***	**Size of cultivated area** ***Luas kawasan tanaman*** Hectare (*Hektar*)	**Ownership status Status pemilikan Code (Kod) 1**	**Crop** ***Tanaman*** **Code (Kod) 2**	**Distance between plots and home** ***Jarak antara plot dan rumah*** (km)

Code (*Kod*) 1
1 = Own paddy plots (*Sawah sendiri*)
2 = Rented (*Sewa*)
3 = Divide the yield (*Bahagi hasil*)

Code (*Kod*) 2
1 = Paddy (*Padi*)
2 = Oil palm (*Kelapa sawit*)
3 = Lain-lain (*Others*)

6.2 Information on production input for paddy
Maklumat input pengeluaran untuk tanaman padi

6.2.1 Input cost for one season
Kos input untuk satu musim

Input cost/season ***Kos input/musim***	**RM**	**Operational cost/season Kos operasi/musim**	**RM**
Fertilizer *(Baja)*		Replanting (*Menyulam*)	
Seeds & planting *(Benih & penanaman)*		Payment for fertilizer and weedicide application *(Upah meracun/membaja)*	
Weedicides (*Racun rumpai*)		Harvesting payment (*Upah menuai*)	
Insecticides (*Racun serangga*)		Lorry transportation (*Pengangkutan lori*)	
Land preparation (*Penyediaan tanah*)		Land rental (*Sewa tanah*)	
		Other (*Lain-lain*)	
Total cost (RM) ***Jumlah Kos (RM)***			

THANKYOU FOR YOUR COOPERATION IN THIS STUDY.
TERIMA KASIH ATAS KERJASAMA ANDA UNTUK KAJIAN INI.

ANOVA for percapita income by income group

Descriptives

	Income Terciles	N	Mean	Std. Deviation	Std. Error
Percapita income	top 20%	31	991.44	550.585	97.331
	middle 40%	169	818.80	695.911	53.532
	bottom 40%	159	849.50	628.346	49.989
	Total	359	847.70	654.908	34.565

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Percapita income	.380	2	356	.684

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Percapita income	Between Groups	802836.130	2	401418.065	7.617	.001
	Within Groups	152745152.596	356	52697.417		
	Total	153547988.726	358			

Multiple Comparisons

Dependent Variable	Post-hoc Test	(I) Income terciles	(J) Income terciles	Mean Difference (I-J)	Std. Error	Sig.
Percapita income	Scheffe	top 20%	middle 40%	172.642*	43.516	0.000
			bottom 40%	141.94*	44.914	0.005
		middle 40%	top 20%	-172.642*	43.516	0.000
			bottom 40%	-30.702	72.487	0.355
		bottom 40%	top 20%	-141.94*	44.914	0.005
			middle 40%	30.702	72.487	0.355

*. The mean difference is significant at the 0.05 level.

ANOVA for household participation in income-generating activities

Descriptives

Participation	Income Terciles	N	Mean	Std. Deviation	Std. Error
Agricultural-wage employment	top 20%	31	1.44	.504	.089
	middle 40%	169	1.73	.446	.034
	bottom 40%	159	1.58	.495	.039
	Total	359	1.64	.481	.025
Non-farm wage employment	top 20%	31	.09	.296	.052
	middle 40%	169	.14	.350	.027
	bottom 40%	159	.55	.499	.040
	Total	359	.32	.466	.025
Non-farm self-employment	top 20%	31	.13	.336	.059
	middle 40%	169	.08	.276	.021
	bottom 40%	159	.08	.276	.022
	Total	359	.09	.281	.015

Test of Homogeneity of Variances

Participation	Levene Statistic	df1	df2	Sig.
Agricultural-wage employment	16.347	2	356	.000
Non-farm wage employment	87.411	2	356	.000
Non-farm self-employment	1.221	2	356	.296

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Participation in agricultural-wage employment	Between Groups	3.140	2	1.570	7.006	.001
	Within Groups	79.785	356	.224		
	Total	82.925	358			
Participation in non-farm wage employment	Between Groups	15.394	2	7.697	43.909	.000
	Within Groups	62.405	356	.175		
	Total	77.799	358			
Participation in non-farm self-employment	Between Groups	.053	2	.026	.331	.719
	Within Groups	28.271	356	.079		
	Total	28.323	358			

Robust Tests of Equality of Means

		Statistic	df1	df2	Sig.
Participation in agricultural-wage employment	Welch	6.832	2	85.774	.002
	Brown-Forsythe	6.626	2	117.403	.002
Participation in non-farm wage employment	Welch	40.837	2	96.639	.000
	Brown-Forsythe	54.171	2	227.663	.000
Participation in non-farm self-employment	Welch	.238	2	83.681	.789
	Brown-Forsythe	.283	2	95.287	.755

Post-hoc Test

Multiple Comparisons

Dependent Variable	Post-hoc Test	(I) Income terciles	(J) Income terciles	Mean Difference (I-J)	Std. Error	Sig.
Participation in agricultural-wage employment	Games-Howell	top 20%	middle 40%	-.290*	0.095	0.011
			bottom 40%	-0.145	0.097	0.307
		middle 40%	top 20%	.290*	0.095	0.011
			bottom 40%	.146*	0.052	0.016
		bottom 40%	top 20%	0.145	0.097	0.307
			middle 40%	-.146*	0.052	0.016
Participation in non-farm wage employment	Games-Howell	top 20%	middle 40%	-0.048	0.059	0.693
			bottom 40%	-.457*	0.066	0.000
		middle 40%	top 20%	0.048	0.059	0.693
			bottom 40%	-.409*	0.048	0.000
		bottom 40%	top 20%	.457*	0.066	0.000
			middle 40%	.409*	0.048	0.000
Participation in non-farm self-employment	Scheffe	top 20%	middle 40%	0.042	0.063	0.783
			bottom 40%	0.043	0.063	0.779
		middle 40%	top 20%	-0.042	0.063	0.783
			bottom 40%	0.001	0.031	1.000
		bottom 40%	top 20%	-0.043	0.063	0.779
			middle 40%	-0.001	0.031	1.000

*. The mean difference is significant at the 0.05 level.

ANOVA for cluster variables

Test of Homogeneity of Variances

Variable	Levene Statistic	df1	df2	Sig.
Share of farm income	12.062	3	355	0.000
Share of agricultural-wage income	13.089	3	355	0.000
Share of nonfarm income	45.122	3	355	0.000

Robust Tests of Equality of Means

		Statistic	df1	df2	Sig.
Share of farm income	Welch	803.472	3	130.572	0.000
	Brown-Forsythe	613.915	3	205.717	0.000
Share of agricultural-wage income	Welch	93.430	3	139.635	0.000
	Brown-Forsythe	186.775	3	132.165	0.000
Share of nonfarm income	Welch	881.514	3	124.441	0.000
	Brown-Forsythe	923.334	3	205.967	0.000

Multiple Comparisons

Dependent Variable	Post-hoc test	(I) 4 clusters	(J) 4 clusters	Mean Difference (I-J)	Std. Error	Sig.
Share of farm income	Games-Howell	1	2	29.887*	1.604	0.000
			3	58.436*	1.325	0.000
			4	30.077*	1.203	0.000
		2	1	-29.887*	1.604	0.000
			3	28.549*	1.964	0.000
			4	0.19	1.883	1.000
		3	1	-58.436*	1.325	0.000
			2	-28.549*	1.964	0.000
			4	-28.358*	1.653	0.000
		4	1	-30.077*	1.203	0.000
			2	-0.19	1.883	1.000
			3	28.358*	1.653	0.000
Share of agricultural-wage income	Games-Howell	1	2	-25.961*	1.569	0.000
			3	0.434	0.8	0.948
			4	-0.257	0.774	0.987
		2	1	25.961*	1.569	0.000
			3	26.396*	1.664	0.000
			4	25.705*	1.652	0.000
		3	1	-0.434	0.8	0.948
			2	-26.396*	1.664	0.000
			4	-0.691	0.952	0.887
		4	1	0.257	0.774	0.987
			2	-25.705*	1.652	0.000
			3	0.691	0.952	0.887
Share of nonfarm income	Games-Howell	1	2	-3.926*	1.028	0.002
			3	-58.87*	1.279	0.000
			4	-29.821*	1.104	0.000
		2	1	3.926*	1.028	0.002
			3	-54.945*	1.572	0.000
			4	-25.895*	1.433	0.000
		3	1	58.87*	1.279	0.000
			2	54.945*	1.572	0.000
			4	29.05*	1.623	0.000
		4	1	29.821*	1.104	0.000
			2	25.895*	1.433	0.000
			3	-29.05*	1.623	0.000

*. The mean difference is significant at the 0.05 level.

ANOVA for percapita income by livelihood cluster

Descriptives

	Cluster	N	Mean	Std. Deviation	Std. Error
Percapita income	1	162	656.37	425.677	33.444
	2	59	694.44	436.542	56.833
	3	68	1309.64	1004.842	121.855
	4	70	970.92	574.608	68.679
	Total	359	847.70	654.908	34.565

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Percapita income	16.846	3	355	.859

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Percapita income	Between Groups	22889255.329	3	7629751.776	20.730	.000
	Within Groups	130658733.397	355	368052.770		
	Total	153547988.726	358			

Post-Hoc Test

Multiple Comparisons

Dependent Variable	Post-hoc test	(I) Group of 4 clusters	(J) Group of 4 clusters	Mean Difference (I-J)	Std. Error	Sig.
Percapita income	Scheffe	1	2	-38.075	92.25	0.982
			3	-653.269*	87.661	0.000
			4	-314.549*	86.775	0.005
		2	1	38.075	92.25	0.982
			3	-615.194*	107.939	0.000
			4	-276.475	107.22	0.086
		3	1	653.269*	87.661	0.000
			2	615.194*	107.939	0.000
			4	338.719*	103.298	0.014
		4	1	314.549*	86.775	0.005
			2	276.475	107.22	0.086
			3	-338.719*	103.298	0.014

*. The mean difference is significant at the 0.05 level.

Independent t-test results (cluster comparison)

Cluster 3 and 1

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	3	68	1309.64	1004.842	121.855
	1	162	656.37	425.677	33.444

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.680	.410	7.166	228	.000	.27914	.03896
	Equal variances not assumed			6.878	115.299	.000	.27914	.04058

Cluster 3 and 2

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	3	68	1309.64	1004.842	121.855
	2	59	694.44	436.542	56.833

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.388	.534	5.143	125	.000	.25179	.04896
	Equal variances not assumed			5.184	124.863	.000	.25179	.04858

Cluster 3 and 4

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	3	68	1309.64	1004.842	121.855
	4	70	970.92	574.608	68.679

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.300	.585	2.244	136	.026	.10547	.04700
	Equal variances not assumed			2.241	134.026	.027	.10547	.04707

Cluster 2 and 1

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	2	59	694.44	436.542	56.833
	1	162	656.37	425.677	33.444

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.003	.960	.690	219	.491	.02735	.03962
	Equal variances not assumed			.694	103.934	.490	.02735	.03943

Cluster 4 and 1

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	4	70	970.92	574.608	68.679
	1	162	656.37	425.677	33.444

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.032	.858	4.638	230	.000	.17367	.03745
	Equal variances not assumed			4.624	130.147	.000	.17367	.03756

Cluster 4 and 2

Group Statistics

	Cluster	N	Mean	Std. Deviation	Std. Error Mean
Percapita income	4	70	970.92	574.608	68.679
	2	59	694.44	436.542	56.833

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percapita income	Equal variances assumed	.011	.916	3.171	127	.002	.14633	.04615
	Equal variances not assumed			3.175	124.013	.002	.14633	.04608